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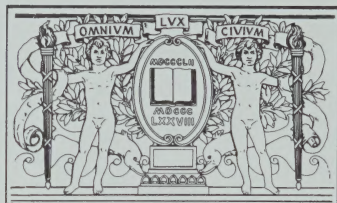
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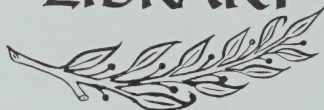
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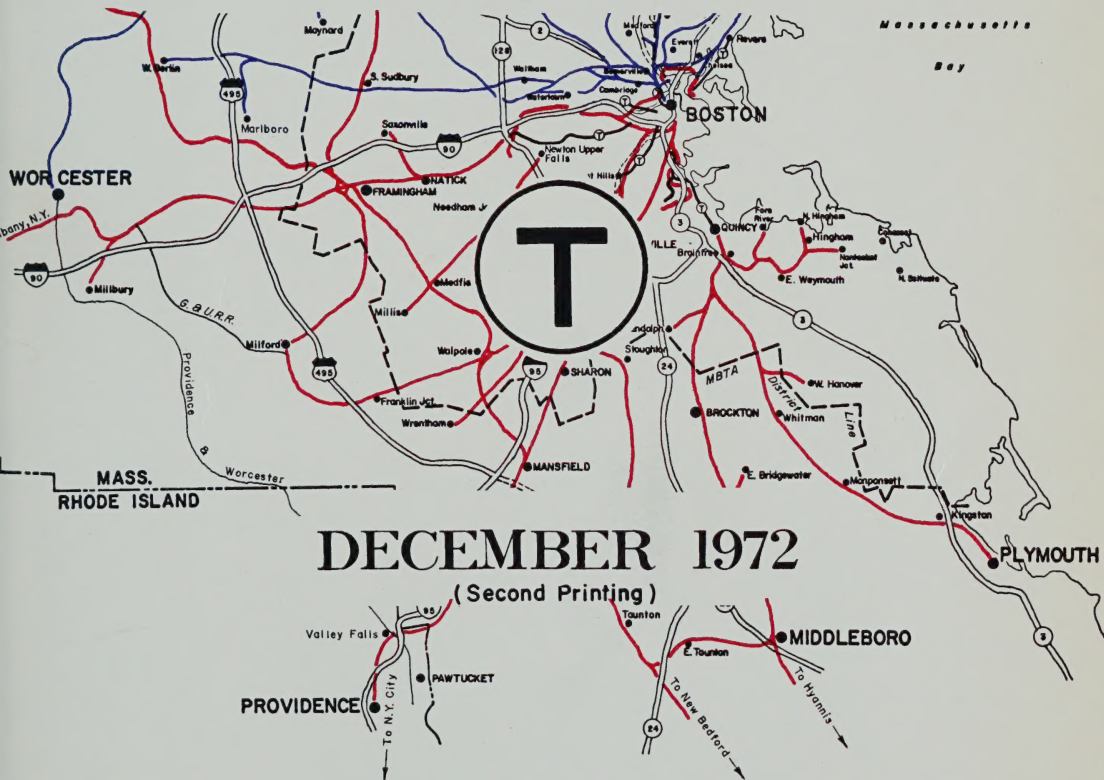
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PLAN FOR ACQUISITION AND USE



OF RAILROAD RIGHTS OF WAY



THOMAS K. DYER, INC.
CONSULTING ENGINEERS

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PLAN FOR
ACQUISITION AND USE OF RAILROAD RIGHTS-OF-WAY

DECEMBER 1972

For

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

by

Thomas K. Dyer, Inc.
Consulting Engineers

The preparation of this report has been financed in part through a grant from the U. S. Department of Transportation, Urban Mass Transportation Administration, under the Urban Mass Transportation Act of 1964, as amended.

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Plate only

THOMAS K. DYER, INC.

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February 8, 1973

Robert G. Davidson, Director of Planning and Construction
Massachusetts Bay Transportation Authority
500 Arborway
Jamaica Plain, Massachusetts 02130

Re: MBTA Contract No. PC-012
Planning and Feasibility Study
Railroad Rights-of-Way and Freight Operations

Dear Mr. Davidson:

In accordance with the terms of the above contract, twenty-five copies of the final report are submitted herewith. This report recommends a railroad freight system to meet efficiently present and future requirements within the study area, mass transportation concepts for use of the available railroad rights-of-way, and a right-of-way acquisition program. Cost estimates for the recommended transportation system by lines are included in the report, construction priorities are established and minimum construction times estimated by program segments.

Insofar as possible, this study has made use of, and has been coordinated with, planning work previously done by the Authority and the plans and reports of the Boston Transportation Planning Review. In accordance with Supplemental Agreement No. 1 of the contract, cost estimates and physical characteristics of railroad rights-of-way and facilities were furnished to the Commuter Railroad Improvement Program technical committee as requested and as provided in the scope of Supplement No. 1.

Robert G. Davidson, Director of Planning and Construction
February 8, 1973
Page 2

It is hoped the transportation and acquisition program developed in this report for the Authority can play an important part in the future development of a balanced transportation system in eastern Massachusetts.

The assistance and cooperation of the Authority's staff in the preparation of this report is sincerely appreciated.

Very truly yours,

A handwritten signature in dark ink, appearing to read 'T. K. Dyer', is written over the typed name.

T. K. Dyer

TKD:dd
enclosures

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SUMMARY

A study has been made for the Massachusetts Bay Transportation Authority by Thomas K. Dyer, Inc. to develop the best transportation use of the railroad rights-of-way serving the Boston Area within the approximate limits of interstate route 495. A map of the study area is on the opposite page.

Forty-seven rights-of-way were included in the study totalling 553 miles. An inventory was made of the physical characteristics of the railroad rights-of-way, freight and passenger train operations, freight traffic by lines and by individual customers, passenger traffic by lines and stations, and location and use of switching yards, equipment repair and servicing areas, and other supporting facilities.

Recommended Railroad Freight System

Based on the inventory of the freight service and freight traffic trends, a railroad freight service and facilities system was developed. The purpose of the recommended freight system is to provide an efficient rail freight service with adequate capacity to meet the present and future needs of the study area and, at the same time, to make the maximum number of railroad rights-of-way available for mass transportation purposes.

Freight carloads originating and terminating within the study area have been declining steadily over the last twenty years. A review of freight car movements into Boston indicates a reduction in carloads of about seventy per cent since 1952.

The cars moving in and out of the Boston area annually on the four freight routes presently in use (Penn Central; Shore Line-Dorchester Branch and Boston & Albany; Boston and Maine; Fitchburg-Freight Cut-off and New Hampshire) are:

	<u>LOADS</u>	<u>EMPTYIES</u>	<u>TOTAL</u>
Inbound	114,000	36,000	150,000
Outbound	<u>58,000</u>	<u>92,000</u>	<u>150,000</u>
	172,000	128,000	300,000

This amounts to 500 cars daily entering Boston which is less than half the capacity of one track.

Since the merger of the New Haven into the Penn Central system, the Railroad has encouraged the movement of freight to the study area via the Boston and Albany rather than the Shore Line. To consolidate efficiently Penn Central through-freight traffic onto the Boston & Albany, overhead clearance improvements and a South Boston connection to the Boston & Albany near South Station are needed.

Boston and Maine through-freight traffic to the study area can also be via the Boston & Albany by means of a trackage rights agreement with the Penn Central for operation of Boston and Maine trains over the Penn Central similar to existing agreements which permit operation of Penn Central trains over Boston and Maine tracks to East Boston. Boston & Maine trains could operate over the Boston & Albany line from Springfield or Worcester to Beacon Park, Allston, and thence over the Grand Junction Branch to the Boston and Maine Freight Yards.

The proposed joint use of the Boston & Albany and the Grand Junction Branch offers advantages to both railroads in reduced operating and maintenance expenses through shared costs of a one-corridor, East-West, through-freight line and more underutilized lines available for sale for mass transportation purposes.

Mass Transportation Use of Railroad Rights-of-Way

The Commuter railroads have provided radial transportation to and from Boston for many years over seven major rail corridors and the branch lines feeding into them:

1. Old Colony - Boston to Quincy (now MBTA South Shore Line)
2. Shore Line - Boston to Providence
3. Boston & Albany - Boston to Worcester
4. Fitchburg - Boston to Ayer
5. New Hampshire - Boston to Lowell
6. Portland West - Boston to Haverhill (north of Reading now served
by New Hampshire)
7. Portland East - Boston to Newburyport

Sixteen thousand people enter Boston each day over the rail corridors via the commuter railroads. Increased use of the rail corridors for mass transportation will offer advantages in reduced highway congestion and engine emissions, reduced land use requirements for highway and parking improvements and reduced home and business relocation resulting from such improvements.

The experience gained from the Mass Transportation Commission program, the MBTA South Shore Line, and programs in other cities for improved railroad commuter, rapid transit, and bus service indicates ridership on mass transportation systems can be increased when the proper conditions exist and the right policies are adopted.

The Commonwealth's railroad subsidy program which began in 1965 has preserved railroad commuter service during a period of major study and re-evaluation of transportation systems. The subsidy program has been by intent a short-term plan and has been complicated by the serious financial plight of the Railroads which has led to the bankruptcy of both the Boston and Maine and the Penn Central during this period. A steady deterioration of the fixed plant, equipment and employee morale of the Railroads has resulted in reduced operating speeds and quality of service.

The condition of railroad facilities limits continuation of passenger service beyond 1973 without initiating a carefully planned and scheduled program for upgrading plant and equipment over the next decade.

Future use of the rail corridors by the Commonwealth for mass transportation purposes would appear to require, as first priority, acquisition of the rights-of-way or a long-term lease of facilities involved in the proposed use in order to progress any improvement programs.

The many systems which are available for the mass movement of people were considered for development in the railroad commuter corridors. The systems which appeared most feasible were:

1. A reorganized and upgraded railroad commuter service.
2. South Shore style rapid transit extensions over railroad rights-of-way.
3. Transit extensions over railroad rights-of-way by means of an overhead catenary power system with the minimum railroad facility changes necessary for operation of transit cars over railroad tracks and joint railroad-transit use of tracks.
4. Various combinations of the above rail transportation systems.

Improved Railroad Commuter System

A study was initiated at the request of Governor Sargent early in 1972 to develop a "Commuter Rail Improvement Program." A preliminary report for discussion purposes was completed in November. The report recommends consideration be given to a program of plant and equipment upgrading to improve comfort, speed and reliability, additional equipment be acquired to increase the capacity and frequency of service, and a consumer-oriented marketing and sales program instituted. An estimated 42% increase in ridership is forecast by 1980 in the CRIP report if the program is progressed.

An approximate estimate of the Commonwealth's investment (including Federal funds) over the next ten to twenty years to achieve an improved railroad commuter system on a limited basis is \$250,000,000 including acquisition of, and improvement to, equipment and the fixed plant. This estimate does not include any cost of the anticipated operating losses of the system.

A commuter rail system as recommended by CRIP in its preliminary report envisions increased use of a presently operating system and a relatively flexible time period for the capital investment program.

The existing commuter railroad operation has a major disadvantage as a public transportation system for commuters in the location of its Boston station terminals. The Boston Transportation Planning Review has recognized the commuter railroad terminal problem by suggesting a study of a railroad connection between North Station and South Station. A connector adequate for present and future service requirements would appear to have a construction cost in the hundreds of millions of dollars.

The high cost and construction problems involved in building a connector compel careful analysis to ensure the benefits are commensurate with the cost and that similar or greater benefits cannot be achieved more economically by other means.

Grade-Separated, Exclusive-Use Rapid Transit Extensions

The design standards of the South Shore and Haymarket North Projects produce excellent rail transportation facilities comparable, in highway terms, to the interstate system. The construction cost of the new transit extensions are presently ranging from \$6 million to \$30 million per mile. The relative scarcity of rail transportation capital funds limits the number of miles that can be constructed on this basis. Transit extensions over railroad lines eliminate the Boston Terminal Station problem of the railroad by offering improved Boston destination choices and better transfer to other transit lines.

Minimum Cost Transit Extensions over Railroad Rights-of-Way

An alternative to either an upgraded railroad system or South Shore style rapid transit extensions is a "minimum cost" transit extension program to combine some of the advantages of each system.

The minimum cost transit extension program would permit operation of transit equipment by construction of an overhead catenary power system over

the existing railroad tracks and right-of-way. Third rail transit cars would be equipped with pantographs for operation similar to the Blue Line transfer from third rail to pantograph at Maverick Station. The greater safety and reliability of the grade-separated (from both highway and railroad freight operations) system of a South Shore Line is sacrificed in the minimum cost system and the right-of-way and operating standards of the existing railroad line substituted. The option to upgrade the right-of-way over the long term, as proposed for an upgraded commuter railroad, is also open to the minimum cost transit extension. Joint operation of transit and local freight trains would be permitted where necessary.

The minimum cost transit extension system provides the railroad commuter with the Boston destinations of the transit line to which they connect as well as improved transfers to other MBTA lines.

The minimum cost overhead catenary transit extension appears feasible on all railroad commuter corridors except the Boston & Albany. The Boston & Albany corridor is recommended for the through-freight operations into the Core Area. Through-freight traffic requires maximum overhead clearance which increases the cost of installing an overhead catenary system in this corridor as compared to the other five railroad commuter corridors.

It is recommended that upgraded Budd car equipment be used for the Boston & Albany corridor in the suburban service and that such service be coordinated with bus and transit operations. Budd car suburban service in the Boston & Albany corridor would offer a new within station transfer to the Orange Line at Back Bay with time and convenience savings in transfer to the MBTA as compared to either Back Bay or South Station now. Consideration should be given to including the Back Bay railroad - transit transfer in one fare for the Boston & Albany corridor trains and turning the service at Back Bay.

The operating cost of the overhead catenary transit extension system is significantly less than the existing railroad commuter service for the following reasons:

1. The manning rules of both the Penn Central and Boston and Maine result in from 1.3 men per car to 2.0 men per car depending on the length of train versus one man per car on the MBTA with onboard fare collection. Based on operating the present train schedule with equivalent seating capacity per train, transit operation is estimated to be \$1,100,000 less annually than the existing railroad cost.
2. The North Station railroad terminal, including Tower A and the Engine Terminal would be eliminated by the transit extension on all four Boston and Maine railroad commuter corridors. The cost of operating these facilities now borne by the MBTA is \$1,200,000 annually.
3. South Station Terminal expenses included in the MBTA subsidy contract are estimated to be \$600,000 annually. This expense can be eliminated entirely by an overhead catenary transit extension in the Shore Line corridor and if the proposed Boston & Albany Budd car service is turned at Back Bay.

Total annual operating savings of the overhead catenary transit extension system, as compared to the present railroad commuter service, is \$2,900,000 (50% of the 1971 commuter railroad subsidy).

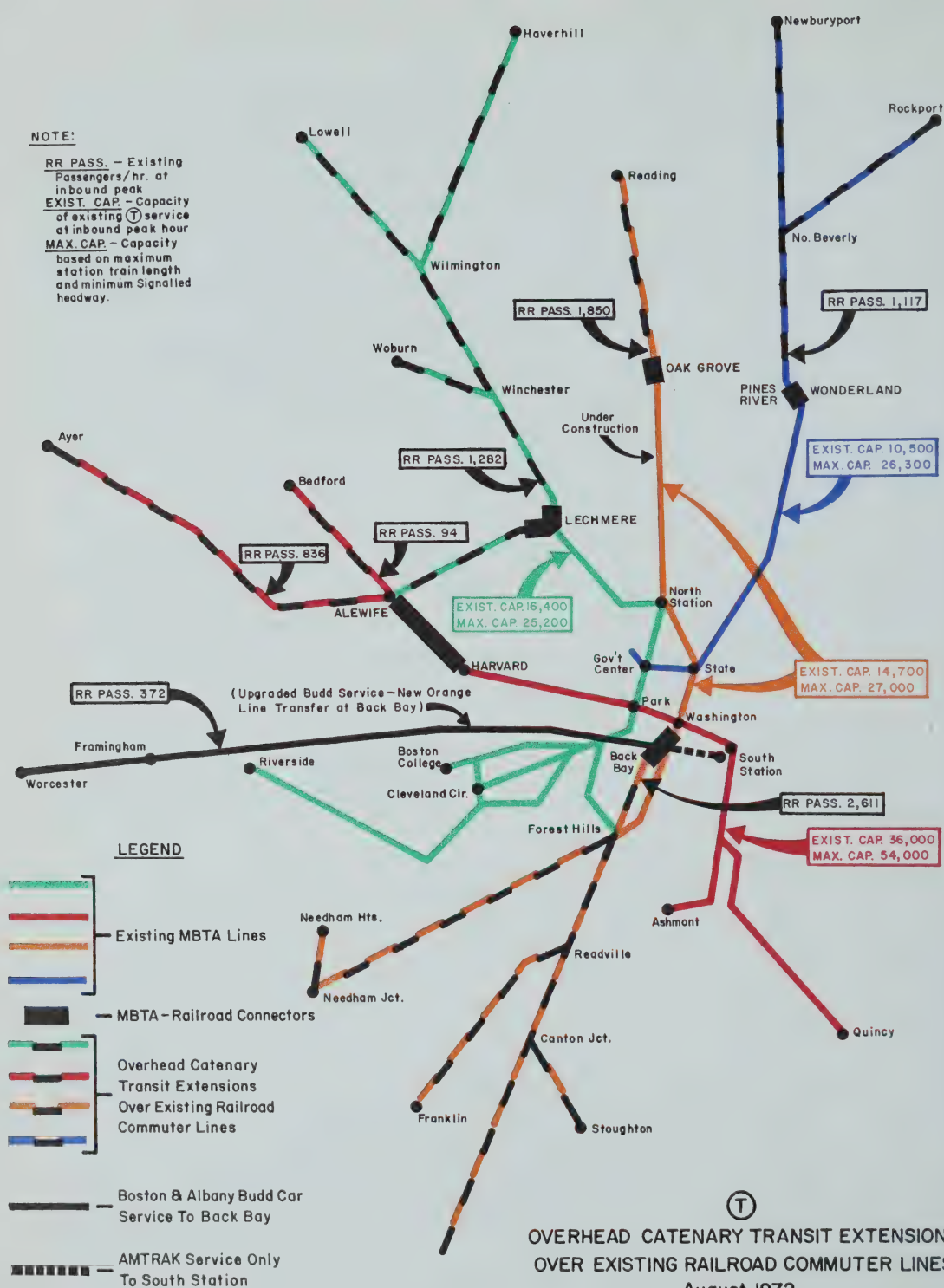
Recommended Mass Transportation Plan

A minimum cost overhead catenary transit extension program is recommended for the Boston-Suburban area. The recommended system has lower operating costs and appears to best meet the two most significant problems faced in the development of an improved rail transportation system:

1. Good Boston destination choice.
2. Relatively modest initial investment and flexibility of capital investment with time to meet available financial resources.

NOTE:

RR PASS. - Existing
Passengers/hr. at
inbound peak
EXIST. CAP. - Capacity
of existing ① service
at inbound peak hour
MAX. CAP. - Capacity
based on maximum
station train length
and minimum signalled
headway.



①
**OVERHEAD CATENARY TRANSIT EXTENSIONS
OVER EXISTING RAILROAD COMMUTER LINES
August 1972**

Thomas K. Dyer, Inc.

● Providence

A schematic map of overhead catenary transit extensions over the existing railroad commuter lines is on the opposite page. Inbound peak hour railroad passengers are shown on the map and also existing and maximum peak hour service capacity of the transit lines. The capacity capability of the system is summarized in the table below:

<u>Inbound Peak Hour</u>					
Corridor	Existing MBTA Service Capacity	Maximum MBTA Capacity	MBTA Reserve Capacity	Present Railroad Commuter Passengers	% Railroad Passengers to MBTA Reserve Capacity
Portland East - Blue Line	10,500	26,300	15,800	1,117	7.1
Portland West - Orange Line ¹	14,700	27,000	12,300	1,850	15.0
New Hampshire Green Line	16,400	25,200	8,800	1,282	14.6
Fitchburg - Red Line	36,000	54,000	18,000	930	5.2
Shore Line - Orange Line ²	14,700	27,000	12,300	2,611	21.2
TOTALS	92,300	159,500	67,200	7,790	11.6

¹Southbound

²Northbound

Except for those working in the immediate vicinity of North Station, present railroad commuters to North Station should save a minimum of 10 to 15 minutes via the proposed suburban transit system since: (1) the trip time on the railroad line is reduced by the improved station stop time due to better loading and unloading and acceleration and deceleration characteristics of transit equipment; (2) those now transferring to the MBTA (40%) from the train save an 8 to 9

minute railroad transit transfer time; and (3) for those who walk, the Government Center - State Street area (an 8 to 10 minute walk) is the closest area drawing a substantial number of commuters.

For the Shore Line corridor commuters, the trip time comparison indicates a time saving to Back Bay from the stations on the Shore Line corridor of 0 minutes to 13 minutes via the proposed suburban overhead catenary transit system versus the existing railroad commuter schedule. The trip time comparison indicates time savings of the proposed suburban transit system to Washington Street of 2 to 15 minutes and to State Street, 0 to 13 minutes versus commuter railroad time to South Station.

For the Boston & Albany, the trip time comparison indicates the new Orange Line transfer at Back Bay will save over 10 minutes to Washington Street as compared to the present Red Line transfer at South Station. In addition, Framingham to Washington Street via Back Bay and the new Orange Line transfer is one minute less than the present railroad time to South Station.

Some additional riders who have not used the railroad service in the past should be attracted by the combination of better Boston destination choice, reduced trip time, and more convenient transfer to other MBTA lines.

Overhead Catenary Power System

A substantial capital cost is involved in the construction of an overhead catenary system, sub-stations and appurtenances for transit extensions. Over \$60,000,000 would be required to construct an overhead catenary and power system for the railroad lines presently with passenger service.

The power companies in New England have purchased easements over railroad rights-of-way in the past for power transmission lines. Construction of new power lines will become increasingly more difficult with the passage of time due to land taking problems in urban areas.

When train propulsion use can be added to power transmission use of the rights-of-way, it is logical for the power company to own the catenary and power facilities as part of its total plant as it would in other locations with more than one user. Preliminary investigation of the feasibility of ownership of the catenary systems and power distribution systems by the power companies indicates it is practical and that the power companies would make the necessary capital expenditures for the catenary and power system.

The proposed suburban transit system would own and install the trolley wire only (estimated cost approximately \$75,000 per mile of track).

Capital Cost Estimates

Capital cost estimates for transit extensions have been prepared in 1972 dollars for all lines on which rail commuter service is now operated and, also, lines on which potential for rail service appears to exist to assist in evaluating the radial limits of transit extensions and establishing construction priorities. Acquisition costs of rights-of-way, terminal property, and railroad equipment are not included in the cost due to the dispute over the arbitration award on the Reading Line and negotiations underway for additional railroad property. The cost section of this report contains estimates of the costs of overhead catenary transit extensions on various lines and segments of lines to accomplish specific program objectives. Suggested construction priorities and estimated construction times are also included.

Construction and equipment costs have been divided in accordance with the source of funding as follows:

1. Transit funds for the purchase of equipment and track, station, and signal construction.
2. Highway funds are available for transit parking facilities, including access road construction and for elimination of highway-rail grade crossings.

3. Power company funds are recommended for construction of the overhead catenary and power system. (Trolley wire to be owned and installed by the Authority.)
4. Railroad funds to be used for the relocation of railroad facilities. Relocation costs would be reflected in Authority rights-of-way acquisition costs.

The cost estimates prepared for evaluation and planning purposes cover construction and equipment costs for overhead catenary transit extensions over railroad rights-of-way by lines, and segments of lines, totaling 319 miles of road. The total estimated cost, if overhead catenary transit extensions were found feasible on all the lines analyzed, divided into funding sources is:

\$365,000,000	Transit Funds
370,000,000	Highway Funds
96,000,000	Power Co.
<u>7,000,000</u>	Railroad
\$838,000,000	

Comparative per-mile construction costs of the three rail transportation systems considered in this report are estimated to be:

<u>Rail System</u>	<u>Total/Mile Construction Cost</u>	<u>Transit Funds Only/Mile Construction Cost</u>
1. Commuter Railroad Improvement Program	\$1,500,000	\$ 500,000
2. Overhead Catenary Transit Extension Program	\$2,400,000	\$ 900,000
3. South Shore Style Third Rail Transit Extension	\$8,000,000	\$6,000,000

It should be noted the above costs are not for equivalent systems. The upgraded commuter railroad system does not include the cost of a railroad

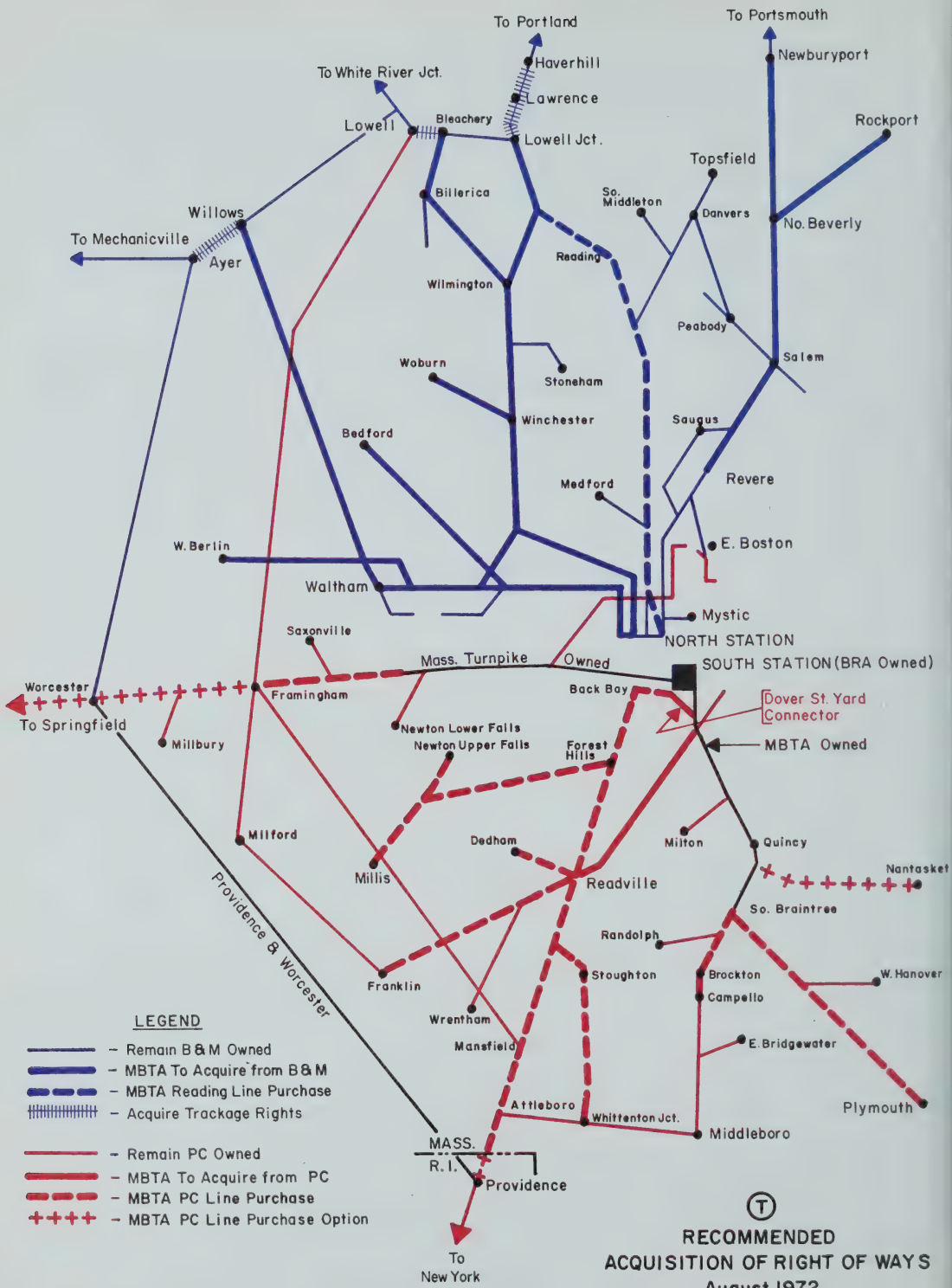
connection between North and South Stations required to improve the Boston Terminal locations. Addition of the connector to the construction cost is estimated to increase the per mile cost of an improved commuter railroad by \$1,000,000 to \$2,000,000 per mile depending on the number of miles over which the cost is distributed. This increased cost would be added to both cost columns above, i.e., total/mile construction cost and transit funds only/mile construction cost.

The South Shore style third rail extension provides a system completely separated from the railroad local freight operations unlike either the improved commuter railroad or the overhead catenary transit extension program. A passenger system completely separated from freight operations offers greater security and dependability than can be provided by joint passenger-freight operation over the same tracks.

Since the minimum cost overhead catenary transit extension program for a major portion of the territory now covered by the railroad commuter service is estimated to require approximately ten years to construct, an interim commuter railroad service should be provided. An upgrading program for the fixed plant should be progressed to maintain adequate railroad commuter service and to upgrade the plant to be utilized in the transit extension program. Upgrading or purchase of railroad equipment should be limited to that necessary for operation of the interim railroad commuter service.

Recommended Acquisition Program

A right-of-way acquisition program is included in the report in addition to the 17-mile Boston and Maine Reading Line and the 146 miles of Penn Central right-of-way now under purchase agreement. A schematic map on the opposite page indicates the lines recommended for acquisition, lines on which trackage rights only are recommended, and the ownership status of other lines. The mileage by lines recommended for acquisition or trackage rights is shown on the following page.




RECOMMENDED
ACQUISITION OF RIGHT OF WAYS
August 1972
 Thomas K. Dyer, Inc.

Line	Acquire Lines	
	Location	Miles
<u>Boston and Maine</u>		
Portland East	MP 8.0 Oak Island to MP 37.3 Newburyport	29.3
Gloucester Branch	MP 18.7 Beverly Jct. to MP 35.3 Rockport	16.6
Portland West	MP 17.2 Wilmington Jct. to MP 19.4 Lowell Jct.	2.2
New Hampshire	MP 1.8 Mystic Jct. to MP 24.7 Bleachery	22.9
Woburn Branch	MP 0.0 Winchester to MP 2.1 Woburn	2.1
Wilmington Branch	MP 0.0 Wilmington to MP 3.0 Wilmington Jct.	3.0
Fitchburg	MP 1.2 Tower H to MP 33.7 Willows	32.5
Fitchburg Freight Cutoff	MP 0.0 Somerville Jct. to MP 4.0 Hill Crossing	4.0
Bedford Branch	MP 4.2 W. Cambridge to MP 14.8 Bedford	10.6
Central Mass. Branch	MP 8.3 Clematis Brook to MP 32.2 W. Berlin	<u>23.9</u>
	Boston and Maine Total	147.1
<u>Penn Central</u>		
Dorchester Branch	MP 1.1 South Bay to MP 10.1 Readville	<u>9.0</u>
	Grand Total	156.1

Trackage Rights		
Boston and Maine Line	Location	Miles
Portland West	MP 19.4 Lowell Jct. to MP 33.0 Haverhill	13.6
New Hampshire	MP 24.7 Bleachery to MP 25.4 Lowell	0.7
Fitchburg	MP 33.7 Willows to MP 36.1 Ayer	<u>2.4</u>
	Total	16.7

Acquisition of Terminal Areas

After the four Boston and Maine railroad corridors are connected to the MBTA transit system, the terminal facilities of the Boston and Maine, including North Station, are no longer necessary. It is recommended

that a corridor be acquired in the North Station area to construct a new Green Line between Leverett Circle and a relocated Green Line North Station, south of Causeway Street, to eliminate the Green Line elevated structure in Causeway Street and improve alignment.

The Terminal area contains approximately 190 acres of Boston and Maine property. This land is situated in Boston (30± acres), Cambridge (45± acres), and Somerville (115± acres). Its present use will be substantially reduced when the rail commuter service is eliminated by the proposed transit extensions.

Proposed changes in freight operations whereby through-freight movements to Boston and Maine destinations in the Core Area will be via the Boston & Albany and the Penn Central Grand Junction Branch, could provide an opportunity for new development of the area now occupied by supporting railroad facilities through the construction of facilities for the future switching and servicing railroad needs on available property outside the present terminal area.

Right-of-way and terminal area acquisition agreements should include conditions requiring the necessary railroad relocation and reserving the necessary right-of-way corridors through the area for the railroad.

The 190 acres of railroad land which will become substantially available will be served by a new Lechmere Terminal with suburban transit service to the northwest and extensive new transit service to Somerville, Porter Square, and North Cambridge. In addition, two new Orange Line transit stations will serve the area, Community College and Sullivan Square, with suburban transit extensions out to Reading and Route 93. To the south, the elimination of the Green Line's Causeway Street elevated structure and construction of two new North Stations on Causeway Street (Orange and Green Line) should spark new development connecting Government Center to the 190-acre terminal area.

The development of the terminal area would require acquisition and planning by several agencies -- the Metropolitan District Commission, for open space, recreational and scenic development along both banks of the

Charles River; the Department of Public Works, for highway construction; the cities of Boston, Cambridge, and Somerville for commercial and residential development; and the Massachusetts Bay Transportation Authority, for construction of transit facilities. In order to facilitate acquisition of railroad land and because the Authority must complete its construction and relocation of the railroad to make the terminal area available, it is recommended the Authority consider acquiring the entire terminal area subject to agreements with the other agencies as to utilization of the land and ultimate purchase by the using agency, municipality, or private developer.

Penn Central land necessary for a connection from the MBTA Dover Street Yard to the Orange Line east of Back Bay should be acquired. In addition, the MBTA should consider purchasing the land and tracks in South Station, now owned by the Boston Redevelopment Authority, as a logical adjunct to the purchase of the Shore Line and Dover Street Yard. Yard 5 (3.5 acres), opposite Dover Street Yard and Southampton Street Yard (23 acres) south of Dover Street Yard, should also be considered for acquisition for yard servicing expansion purposes and/or lease to Amtrak for intercity service. Portions of those yard areas and air rights might be made available to the City of Boston for extension of its South Station Project.

Acquisition of Equipment

Consideration should be given to the purchase, or long-term lease, of 48 Boston and Maine Budd cars to be re-engined and used on both the Penn Central and Boston and Maine during the suburban transit extension construction period and for the proposed Boston & Albany upgraded Budd car service. The remaining railroad equipment should be on short-term lease until it can be released by completion of transit extensions. It is recommended equipment needs and agreement for continuation of existing railroad passenger service during construction of the suburban transit extensions be included as conditions of acquisition of railroad rights-of-way and terminal properties.

SCOPE AND PURPOSE

The Massachusetts Bay Transportation Authority retained Thomas K. Dyer, Inc., Consulting Engineers, to recommend a plan for the best transportation use of the railroad rights-of-way serving the Boston Area within Interstate Route 495.

To develop such a plan, an inventory was made of the physical characteristics of railroad rights-of-way, existing freight and passenger train operations, existing freight traffic by lines and by individual customers, existing passenger traffic by lines and stations, and existing use of switching yards, equipment repair and servicing area, and other supporting facilities. The inventory was made from records and plans furnished by the Boston and Maine and Penn Central railroads, information and records of the Massachusetts Bay Transportation Authority, and field inspection by the Consultant.

Plans for the future use of railroad rights-of-way were reviewed with AMTRAK, the Boston and Maine and Penn Central railroads, Massachusetts Bay Transportation Authority, and the Boston Transportation Planning Review through interviews with, and/or reports by these agencies.

The public necessity for the existing railroad freight service and the freight traffic trends in the Study Area were analyzed. Based on the inventory of freight customers by lines and freight traffic trends, a railroad freight service and facilities system was developed for the long term to determine the availability of individual rights-of-way for mass transportation purposes.

An investigation was also made of railroad right-of-way acquisition

including the factors affecting right-of-way value, methods of acquisition, and conditions for joint use of acquired rights-of-way. Due to the court appeal by the Massachusetts Bay Transportation Authority of the arbitrators' award on the Reading Line and negotiations by the Commonwealth with the Penn Central and Boston and Maine railroads for purchase of certain other lines, right-of-way acquisition is covered in a general rather than specific manner with respect to value.

The considerations involved in joint use of rights-of-way and methods of right-of-way acquisition and use were studied with respect to operational safety and efficiency, labor jurisdictional problems, existing transportation and commerce law, and the rights and powers of the parties involved. Community and/or shipper reaction to joint use and various methods of right-of-way acquisition and use were analyzed for consideration in a recommended plan.

Engineering and transportation criteria for lines with passenger traffic potential were developed for various levels of service. Preliminary capital cost estimates were prepared based on existing Railroad and Massachusetts Bay Transportation Authority engineering data.

The inventory of railroad rights-of-way and analysis of right-of-way availability and alternative systems were used to develop a recommended plan for railroad right-of-way use and acquisition recommendations, and capital costs of the plan over various time periods. Financing, organizational and personnel requirements of the recommended plan are discussed in the report.

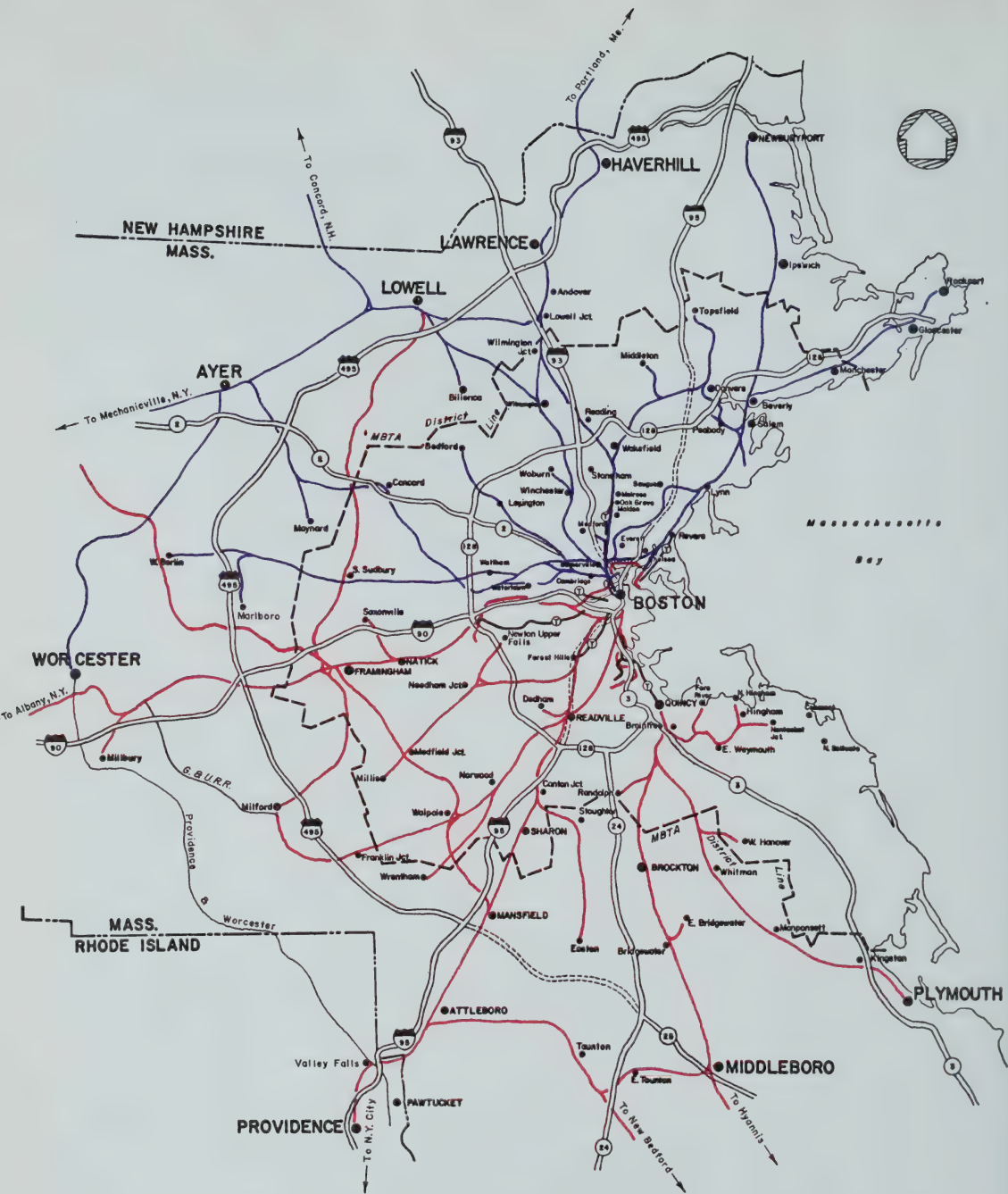
INVENTORY OF RAILROAD RIGHTS-OF-WAY

The existing railroad rights-of-way in the Study Area are shown on the map entitled "Eastern Massachusetts Railroad Lines" on page 4. Route 495 was used as the approximate limit of the study. It should be noted that the railroads have the equivalent of Route 495 in the circumferential line made up of the segments: Providence and Worcester Railroad; and Boston and Maine lines from Worcester to Ayer to Lowell to Lowell Junction; which connect the Penn Central's New Haven "Shore Line" and "Boston and Albany" Line, and the Boston and Maine's Fitchburg, New Hampshire and Portland Lines.

The following principal sources were used to assemble the inventory of the railroad fixed plant:

1. Track charts - 1" = 4000' schematic plan and profile of each right-of-way. Information on track charts includes percent grade, degree of curve, location of track and overhead bridges, grade crossings, track sidings, and stations.
2. Signal charts - 1" = 250' and 500' schematic track plan showing signal systems and crossing protection.
3. Valuation plans - 1" = 100' plans showing track, buildings and property lines.
4. Bridge lists - list of bridges and culverts giving mile post locations, span lengths, and type of structure.
5. Field inspection of each line to determine the general condition of the fixed plant.

The transportation inventory of the railroads within the Study Area was



obtained from the following principal sources:

1. Timetables containing official railroad designation for each line, passenger train schedules and train stops, line speeds and special operating rules and instructions.
2. Railroad personnel for freight trains operated and number of carloads.
3. Field inspection to obtain freight customer information.
4. Mass. Industrial Directory of 1971 for number of employees of freight customers.
5. Massachusetts Bay Transportation Authority for passenger traffic information.

The lines included in this study total 553 miles of road. Approximately 60 freight trains a day handle 209,000 loaded freight cars annually on these lines. Seven hundred sixty-three (763) freight customers are located along the rights-of-way. Three hundred twenty-five (325) passenger trains, including 22 interstate AMTRAK trains operate within the area studied carrying a total of 33,800 passengers per week day.

A summary of the data obtained in the inventory has been compiled in the maps and tables on the succeeding pages:

1. Six (6) SECTOR MAPS showing the location of lines, miles of roads, number of tracks, type of signalling, freight trains operated, number of cars handled by through freights annually, number of freight customers and annual carloads, and number of passenger trains divided between AMTRAK, railroad, and MBTA with total passengers daily in each category. All data is for the summer of 1972 except passenger

counts and number of carloads which are for 1971.

2. Four (4) spread sheets, entitled INVENTORY OF RAILROAD RIGHTS-OF-WAY, giving the following line statistics grouped by sectors:
 - a. Miles of road, track, and signalled track;
 - b. Maximum percent grade and degree of curve;
 - c. Number of grade crossings, overhead bridges and track bridges;
 - d. Timetable line speed for years 1957 and 1972;
 - e. Line maximum freight car capacity and locomotive restrictions (1971);
 - f. Minimum overhead published clearance 10' wide (1971);
 - g. Number of through freight trains daily and annual through freight carloads (1971);
 - h. Number of local freights daily, number of freight customers on the line, and annual carloads of freight customers on the line;
 - i. Total passenger trains per weekday, total weekday passenger customers, and number of passenger stations.
3. Two (2) sheets entitled INVENTORY OF FREIGHT CUSTOMERS grouped by sectors giving the following information (1971):
 - a. Number of freight customers;
 - b. Total annual carloads;
 - c. Approximate total number of freight customer employees;
 - d. Approximate total value of the freight customers' land and buildings.
4. Two (2) sheets entitled YARD AND SERVICING FACILITIES, one for

the Boston and Maine Corp. and one for the Penn Central. Also, two (2) schematic maps showing the LOCATION OF YARD FACILITIES in the CORE AREA for the Boston and Maine Corp. and the Penn Central.

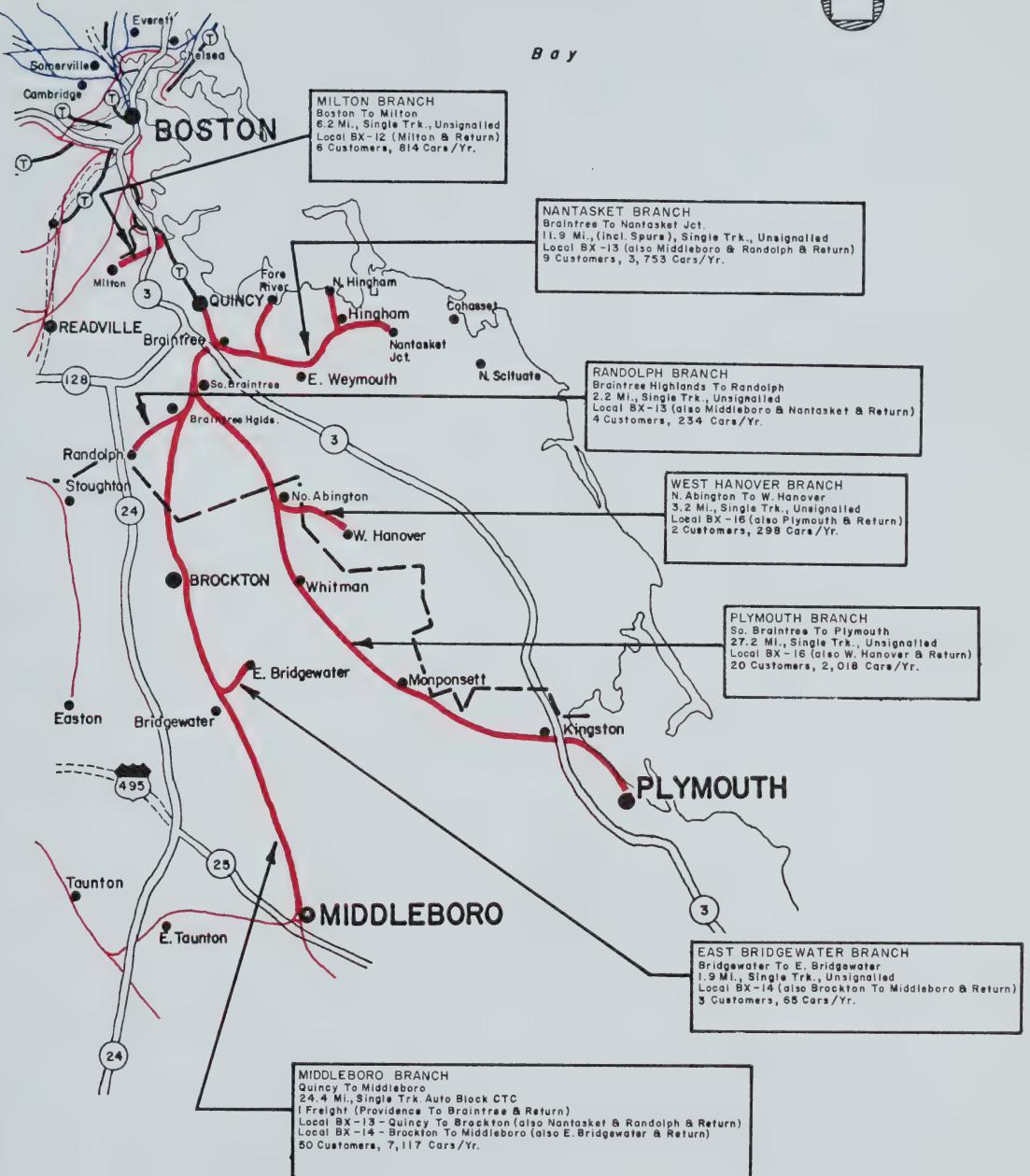
5. Two (2) sheets of passenger terminal facilities entitled SOUTH STATION PASSENGER TERMINAL and NORTH STATION PASSENGER TERMINAL. Also, two (2) schematic maps of the SOUTH STATION TRANSPORTATION CENTER and the NORTH STATION TRANSPORTATION CENTER.
6. Three (3) maps showing passenger traffic data:
 - a. ONE WAY TRAFFIC AT RAPID TRANSIT LINE STATIONS as of February 1971 for comparison of relative volumes carried by transit and railroad.
 - b. BOSTON AND MAINE one-way passenger boarding count divided passengers from parked cars, kiss-and-ride, and walk in. Also, number of parking spaces at each station based on November 1971.
 - c. PENN CENTRAL one-way passenger boarding count divided passengers from parked cars, kiss-and-ride, and walk in. Also number of parking spaces at each station based on November 1971.

On pages 19 and 20, an approximate value of railroad freight customers' land and buildings is included. The basis used to establish value was the application of unit values for land in the general areas and a per square foot

building value considering size, type of construction, condition and age of the structures, all as obtained from an exterior observation of the property only. No attempt was made to project which, if any, of the properties would be vacated or relocated in the event of a curtailment or abandonment of freight service on a given line.



Bay



SOUTHEAST SECTOR

May 1972

Thomas K. Dyer, Inc.

DOVER BRANCH

Needham Jct. To Medfield Jct.
7.3 Mi., Single Trk. Unsignalled
No on line service
Used by Local BX-5 & BX-9

NEEDHAM BRANCH

Forest Hills To Newton Upper Falls
10.7 Mi., Single Trk., Unsignalled
+23 Suburban Trains-MBTA-2536 Pass./Dy.
Local BX-9, Forest Hills To Needham Jct. (also
Dorchester & Millis & Return)
Local BX-5, Newton Upper Falls (out of
Framingham via Dover Br. & Return)
18 Customers, 3117 Cars/Yr.

DORCHESTER BRANCH

Boston To Readville
9.0 Mi., 2 Trk., Auto Block
8-Through Frts., 30,269 Carloads/Yr.
Local BX-9 (also part Needham & Millis &
Return)
4 Customers, 660 Cars/Yr.
Local BX-4 & BX-22, run-no work,
Wrentham, Milford & Return



DEDHAM BRANCH
Readville To Dedham
2.1 Mi., Single Trk., Unsignalled
Local BX-7 (also Shore Line &
Stoughton & Return)
5 Customers, 109 Cars/Yr.

FRANKLIN BRANCH

Readville To Franklin Jct.
18.5 Mi., 2 Trk. Readville To Norwood, Single
Tr., Norwood To Franklin Jct., Auto Block
13 Suburban Trains-MBTA-1622 Pass./Dy.
2 Through Frts. via Walpole (see Dorc. Br.)
21,265 Carloads/Yr.
Local BX-22, (also Milford & Return)
20 Customers, 1665 Cars/Yr.
Local BX-4, run-no work, Wrentham & Return

WRENTHAM BRANCH

Norwood To Wrentham
11.4 Mi., Single Trk., Unsignalled
Local BX-4 - Wrentham & Return
11 Customers, 3224 Cars/Yr.

STOUGHTON BRANCH

Canton Jct. To Easton
9.9 Mi., Single Trk., Unsignalled
8 Suburban Trains-MBTA-Canton To Boston,
PC-Canton To Stoughton
MBTA-44 Pass./Dy.
PC-640 Pass./Dy.
Local BX-7, (also Dedham, Shore Line & Return)
12 Customers, 1681 Cars/Yr.

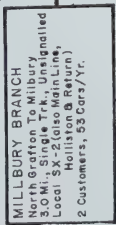
SHORE LINE

Boston To R.I. State Line
38.2 Mi., 4 Trk., Boston To Readville - 2 Trk.,
Readville To State Line, Auto Block
20 AMTRAK Trains, 1493 Pass./Dy.
60 Suburban Trains-MBTA-16 ML Mansfield To
Boston, 8 Stoughton Br., Canton To Boston,
13 Franklin Br., 23 Needham Br.
PC Trains-16 ML, Mansfield To State Line
8 Stoughton Br., Canton To Stoughton
MBTA-8,762 Pass./Dy.
PC-2,771 Pass./Dy.
4-Through Frts. betw. Readville & State Line,
24,600 Carloads/Yr.
1 Freight (Providence To So. Braintree & Return)
1 Freight (Providence To Lowell & Return)
Local BX-7, ML Boston To Canton Jct. (also
Dedham & Stoughton & Return)
Local BX-20, ML State Line To Mansfield & Return
19 Customers, 4,671 Cars/Yr.
Local BX-19, run-no work, Providence To
Walpole & Return.

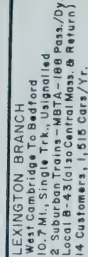
**SOUTHWEST SECTOR**

May 1972

Thomas K. Dyer, Inc.



Thomas K. Dyer, Inc.

[illegible]

MAYNARD BRANCH
South Acton To Maynard
2.2 Mi., Single Trk., Unsignalled
0.5 Mi., in service-no on line service
Local B-9 uses as convenient

FREIGHT CUT OFF
Somerville To West Cambridge
4:00 P.M., Single Trk., C.T.
8 Through Frts. (See Fitchburg
Main Line 68, 388 Carloads/Yr.
Local B-15, W. Cambridge & Return
5 Customers, 594 Cars/Yr.
Locals B-9 & B-13, run, no work
(Fitch. M.L., Bemis &
Maynard & Return)

CENTRAL MASS BRANCH
Clematis Brook(Waltham) To W.
Berlin(also to Marlboro)
26.6 Mi., Single Trk., Unsignalled
(interlocked grade crossing
with PC at S. Sudbury)
Local B-43 (also Lexington & Return)
9 Customers, 963 Cars/Yr.

BEMIS BRANCH
Waltham To Bemis (Watertown)
1.8 Mi., Single Trk., Unsignalled
Local B-13, (also M.L. W. Camb.
To Waltham & Return).
8 Customers, 1, 376 Cars/Yr.

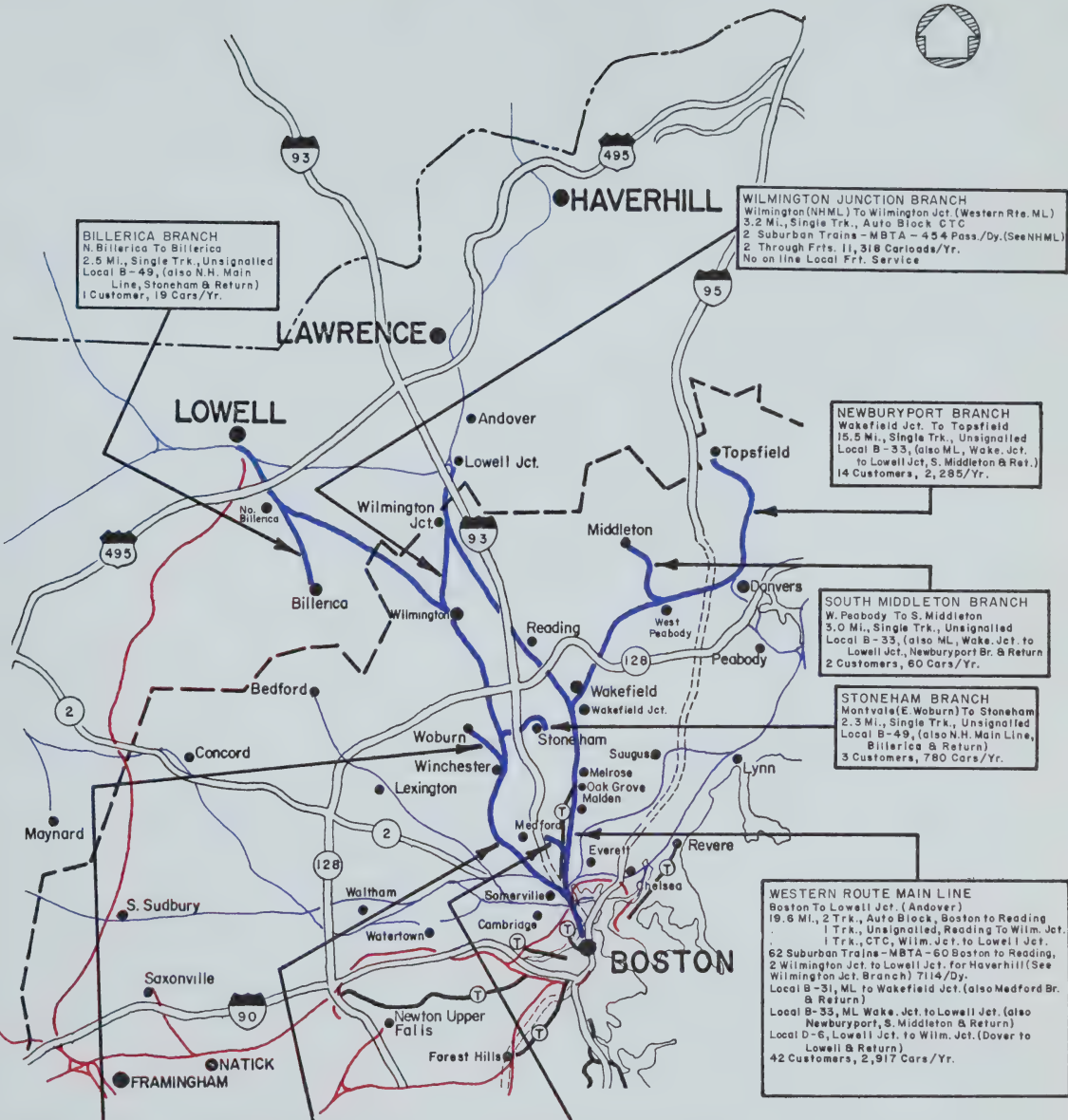
WATERTOWN BRANCH
West Cambridge To Watertown
4.4 Mi., Single Trk, Unsignalled
Local B-3, (also M.L., Boston To
W. Camb. & Return)
14 Customers, 1,292 Cars/Yr.

①

NORTHWEST SECTOR

May 1972

Thomas K. Dyer, Inc.



BILLERICA BRANCH
N. Billerica To Billerica
2.5 Mi., Single Trk., Unsignalled
Local B-49, (also N.H. Main
Line, Stoneham & Return)
1 Customer, 19 Cars/Yr.

WILMINGTON JUNCTION BRANCH
Wilmington(NHML) To Wilmington Jct. (Western Rte. ML)
3.2 Mi., Single Trk., Auto Block CTC
2 Suburban Trains - MBTA - 454 Pass./Dy. (See NHML)
2 Through Frts. 11, 318 Carloads/Yr.
No on line Local Frt. Service

NEWBURYPORT BRANCH
Wakefield Jct. To Topsfield
15.5 Mi., Single Trk., Unsignalled
Local B-33, (also ML, Wake. Jct.
To Lowell Jct., S. Middleton & Ret.)
14 Customers, 2,285/Yr.

SOUTH MIDDLETON BRANCH
W. Peabody To S. Middleton
3.0 Mi., Single Trk., Unsignalled
Local B-33, (also ML, Wake. Jct. to
Lowell Jct., Newburyport Br. & Return
2 Customers, 60 Cars/Yr.

STONEHAM BRANCH
Montvale(E. Woburn) To Stoneham
2.3 Mi., Single Trk., Unsignalled
Local B-49, (also N.H. Main Line,
Billerica & Return)
3 Customers, 780 Cars/Yr.

WESTERN ROUTE MAIN LINE
Boston To Lowell Jct. (Andover)
19.6 Mi., 2 Trk., Auto Block, Boston to Reading
1 Trk., Unsignalled, Reading to Wilm. Jct.
1 Trk., CTC, Wilm. Jct. to Lowell Jct.
62 Suburban Trains - MBTA - 60 Boston to Reading,
2 Wilmington Jct. to Lowell Jct. for Haverhill (See
Wilmington Jct. Branch) 714/Dy.
Local B-31, ML to Wakefield Jct. (also Medford Br.
& Return)
Local B-33, ML Wake. Jct. to Lowell Jct. (also
Newburyport, S. Middleton & Return)
Local D-6, Lowell Jct. to Wilm. Jct. (Dover to
Lowell & Return)
42 Customers, 2,917 Cars/Yr.

WOBURN BRANCH
Winchester To Woburn
2.0 Mi., Single Trk., CTC
41 Suburban Trains - MBTA -
1,172 Pass./Dy.
Local Z-3, (also N.H. Main
Line & Return)
7 Customers, 341 Cars/Yr.

NEW HAMPSHIRE MAIN LINE
Boston To Lowell
25.4 Mi., 2 Trks., Auto Block CTC
77 Suburban Trains - MBTA - 34 ML, Boston To
Lowell, 2 Boston To Wilmington for
Haverhill, 41 ML to Winchester for Woburn
6,432 Pass./Dy.
2 Through Frts. betw. Boston & Lowell
22,756 Carloads/Yr.
Local B-45, Boston To S. Wilmington & Return
Local B-49, Boston To Lowell (also Stoneham,
Billerica & Return)
Local Z-3, Lowell to Winchester (also Woburn
& Return)
37 Customers, 6,295 Cars/Yr.

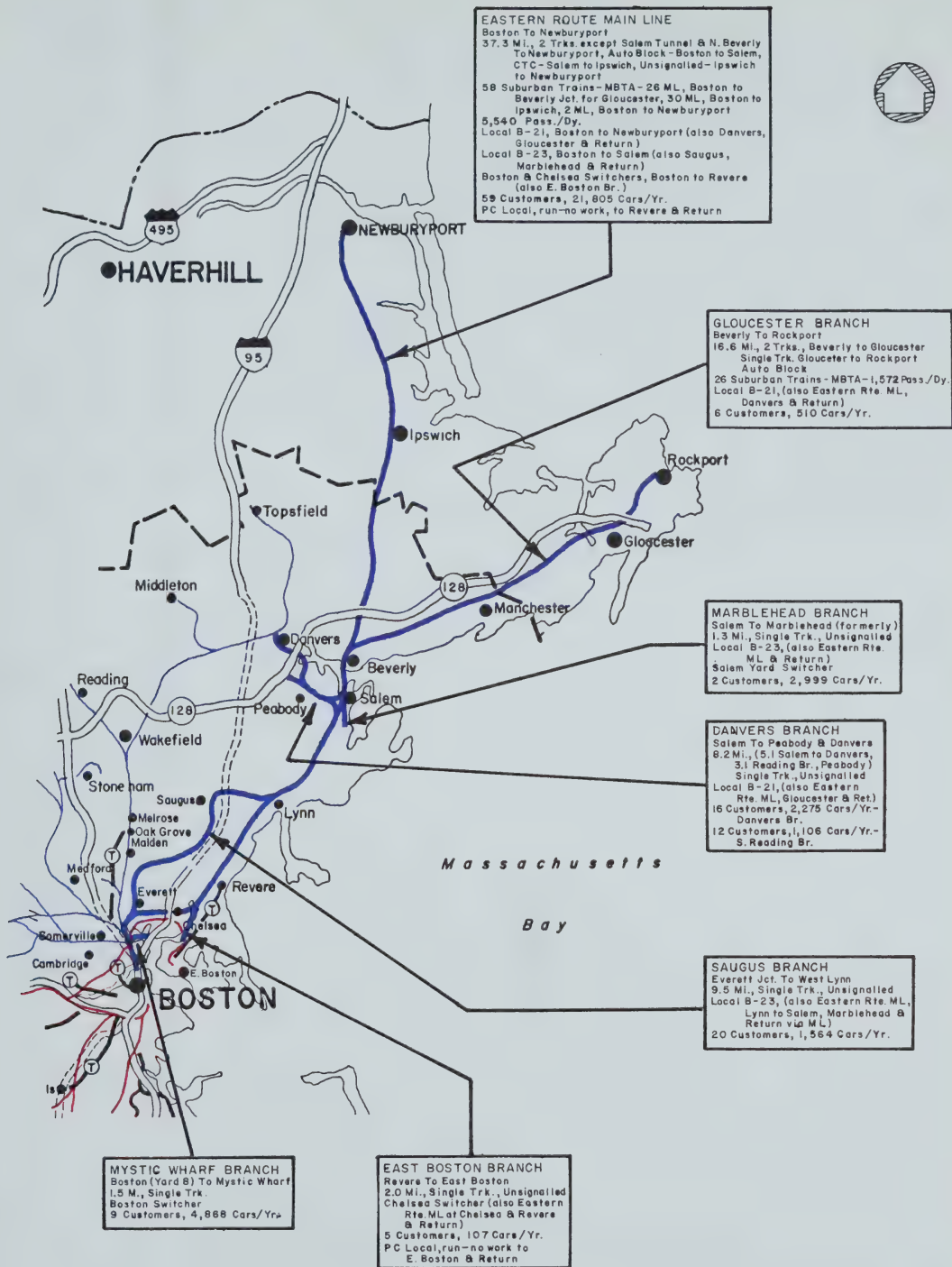
MEDFORD BRANCH
Wellington (Medford Jct.) To Medford
1.1 Mi., Single Trk., Unsignalled
Local B-31, (also ML to Wake Jct.
& Return)
10 Customers, 2,224 Cars/Yr.



NORTH SECTOR

May 1972

Thomas K. Dyer, Inc.



NORTHEAST SECTOR

May 1972

Thomas K. Dyer, Inc.

INVENTORY OF RAILROAD RIGHTS OF WAY

Location	Road Miles	Track Miles	Signed Track	Max. Grade	Max. Curve	No. Grade Crossings	No. Overhead Bridges	No. Track Bridges	Line Speed		Freight Car Capacity	Locomotive Restrict.	Min. O.H. No. Thru	Annual Thru Freight Carloads	No. Local Freight Daily	No. Freight Customers	Annual Carload Freight Customers	Pass. Trains Daily	Total Daily Pass. Poss.	Total Customer Stations
									1957	1972										
PENN CENTRAL TRANSPORTATION COMPANY																				
SOUTHEAST SECTOR																				
MIDDLEBORO BRANCH (BRAINTREE TO MIDDLEBORO)	24.4	24.4	24.4	0.70%	2° 30'	27	23	24	79	50	263,000 #	NONE	16'-0"	2	14,299	2	50	7,117	0	-
PLYMOUTH BRANCH (50 BRAINTREE TO PLYMOUTH)	27.2	27.2	0	0.94%	3° 09'	36	8	5	50	30	220,000 #	NONE	14'-2"	0	-	1	20	2,018	0	-
NANTASKET BRANCH (BRAINTREE TO NANTASKET JCT.)	11.9	11.9	0	0.65%	4° 00'	19	4	5	50	30	220,000 #	NONE	16'-0"	0	-	1	9	3,753	0	-
RANDOLPH BRANCH (BRAINTREE HILLS TO RANDOLPH)	2.2	2.2	0	0.78%	1° 00'	5	2	0	20	10	220,000 #	YES	14'-2"	0	-	1	4	254	0	-
W HANOVER BRANCH (N. ABBINGTON TO W. HANOVER)	3.2	3.2	0	1.45%	5° 44'	9	0	1	35	25	220,000 #	NONE	16'-0"	0	-	1	2	298	0	-
E BRIDGEWATER BRANCH (BRIDGEWATER TO E. BRIDGEWATER)	1.9	1.9	0	0.80%	4° 46'	4	0	1	10	10	160,000 #	YES	16'-0"	0	-	1	3	65	0	-
MILTON BRANCH (BOSTON TO MILTON)	6.2	6.2	0	2.7%	15° 00'	4	8	7	20	15	260,000 #	NONE	14'-6"	0	-	1	6	814	0	-
PENN CENTRAL TRANSPORTATION COMPANY																				
SOUTHWEST SECTOR																				
SHORE LINE (BOSTON TO R.I. STATE LINE)	38.2	98.2	82.3	0.56%	1° 31' 48"	1	55	43	90	79	263,000 #	NONE	14'-3"	4	24,600	5	19	4,671	36*	6,184*
DORCHESTER BRANCH (BOSTON TO READVILLE)	9.0	18.0	18.0	0.957%	2° 30'	1	17	20	50	40	263,000 #	NONE	14'-6"	6	30,269	3	4	660	0	-
NEEDHAM BRANCH (FOREST HILLS TO NEEDHAM)	10.7	10.7	0	0.92%	13° 00'	7	12	23	50	40	263,000 #	NONE	14'-2"	0	-	2	18	3,117	23	2,536
DEDHAM BRANCH (READVILLE TO DEDHAM)	2.1	2.1	0	0.62%	11° 00'	0	4	3	50	20	200,000 #	NONE	14'-2"	0	-	1	5	109	0	-
FRANKLIN BRANCH (READVILLE TO FRANKLIN JCT.)	18.5	24.4	10.6	0.80%	3° 20'	6	10	26	55	50	263,000 #	NONE	14'-2"	2	21,865	2	20	1,665	13	1,622
STOUGHTON BRANCH (CANTON JCT. TO EASTON)	9.9	9.9	0	0.91%	3° 46'	18	2	10	55	40	220,000 #	NONE	14'-6"	0	-	1	12	1,681	8	684
WRENTHAM BRANCH (NORWOOD TO WRENTHAM)	11.4	11.4	0	1.10%	5° 00'	6	15	16	50	20	220,000 #	YES	16'-0"	0	-	1	11	3,224	0	-

* 20 AMTK 1475A/MTK

INVENTORY OF RAILROAD RIGHTS OF WAY

Location	Miles	Track Miles	Signalized Track	Max. Grade	Max. Curve	No. Grade Crossing	No. Overhead Bridges	No. Track Bridges	No. Line Speed	Freight Car Capacity	Locomotive Restrict	Min. O.H. Clearance	No. Thru Freight Trains Daily	Annual Freight Carloads	No. Freight Customers Daily	Annual Freight Customers	Pass. Trains Daily	Total Daily Pass. Customers									
																			1957	1972	10' Wide	Daily	Customers	Daily	Customers	Daily	Customers
PENN CENTRAL TRANSPORTATION COMPANY																											
SOUTHWEST SECTOR (CONT'D)																											
DOVER BRANCH (NEEDHAM JCT TO MEDFIELD JCT)	7.3	7.3	0	1.18%	2°15'	16	2	3	35	25	263,000*	YES	16'-0"	0	2	0	0	-									
MILFORD BRANCH (FRANKLIN JCT TO MILFORD)	8.5	8.5	0	0.91%	4°35'	16	5	7	30	20	220,000*	NONE	16'-0"	0	-	3	1,560	0									
PENN CENTRAL TRANSPORTATION COMPANY																											
WEST SECTOR																											
BOSTON & ALBANY MAIN LINE (BOSTON TO WORCESTER)	44.5	89.0	89.0	0.78%	3°04'	4	56	12	65	60	263,000*	EAST OF FRAM- INGHAM	SEE NOTE 1	10	79,060	2	21	13,327	8* 1,998*								
NEWTON LOWER FALLS BRANCH (RIVERSIDE TO NEWTON LOWER FALLS)	1.6	1.6	0	1.68%	12°50'	3	0	2	20	10	220,000*	YES	**	0	-	1	2	90	-								
SAXONVILLE BRANCH (NATICK TO SAXONVILLE)	4.0	4.0	0	0.90%	5°30'	7	3	1	20	15	263,000*	YES	15'-1"	0	-	1	17	2,575	0								
HOLLISTON BRANCH (FRAMINGHAM TO MILFORD)	12.0	12.0	0	0.50%	3°30'	12	4	5	25	15	220,000*	YES	14'-0"	0	-	1	7	591	0								
MILLBURY BRANCH (NO. GRAFTON TO MILLBURY)	3.0	3.0	0	0.62%	3°00'	8	2	0	25	10	220,000*	YES	**	0	-	1	2	53	0								
GRAND JCT BRANCH (BEACON PARK TO E. BOSTON)	9.7	9.7	0	1.0%	9°35'	10	12	2	15	15	263,000*	YES	14'-6"	0	-	1	47	15,450	0								
BOSTON AND MAINE CORPORATION																											
NORTHWEST SECTOR																											
FITCHBURG MAIN LINE (BOSTON TO AYER)	36.0	62.5	62.5	0.755%	4°34'	29	29	18	70	50	263,000*	NONE	16'-6"	8	68,388	5	37	7,260	40 2,566								
FREIGHT CUT-OFF (SOMERVILLE TO W. CAMBRIDGE)	4.0	4.0	4.0	0.68%	4°30'	9	2	0	30	25	263,000*	NONE	16'-6"	8	68,388	3	5	1,118	0								
LEXINGTON BRANCH (W. CAMBRIDGE TO BEDFORD)	10.7	10.7	0	1.17%	8°56'	23	6	9	45	20	263,000*	NONE	15'-3"	0	-	-	14	1,515	2 188								
WATERTOWN BRANCH (W. CAMBRIDGE TO WATERTOWN)	4.4	4.4	0	0.68%	4°30'	11	6	1	30	10	263,000*	NONE	16'-2"	0	-	1	14	1,292	0								
DEWIS BRANCH (WALTHAM TO WATERTOWN)	1.8	1.8	0	0.67%	4°30'	6	0	3	30	10	263,000*	NONE	16'-2"	0	-	1	8	1,376	0								

** NOT AVAILABLE

2 AMTK
120
AVTK

INVENTORY OF RAILROAD RIGHTS OF WAY

Location	Road Miles	Track Miles	Track Signaled	Max. Grade	Max. Curve	No. Grade Crossings	No. Overhead Bridges	No. Track Bridges	Line Speed		Freight Car Capacity	Locomotive Restrict. 10' Wide	Min. O.H. Clearance	Annual Thru Freight Carloads	No. Local Freight Customers	Annual Carload Freight Customers	Pass. Trains Daily	Total Daily Pass. Customers	
									1957	1972									
BOSTON AND MAINE CORPORATION																			
NORTHWEST SECTOR (CONT'D)																			
CENTRAL MASS BRANCH (WALTHAM TO BERLIN, INCLUDING MARLBORO BRANCH)	26.6	26.6	0	1.76%	5°00'	4.7	9	12	40	20	220,000 #	YES	17'-9"	0	1	21	963	0	-
MAYNARD BRANCH (50 ACORN TO MAYNARD) (OUT OF SERVICE)	2.2	2.2	0	1.87%	15°15'	7	1	2	35	-	220,000 #	YES	17'-9"	0	0	0	0	-	-
BOSTON AND MAINE CORPORATION																			
NORTH SECTOR																			
WEST ROUTE MAIN LINE (BOSTON TO ANDOVER)	19.6	31.4	25.5	0.71%	2°44'	2.7	16	14	70	70	263,000 #	NONE	15'-9"	0	3	42	2,917	60	6,660
NEW HAMPSHIRE MAIN LINE (BOSTON TO LOWELL)	25.4	50.8	50.8	0.637%	2°30'	4	39	17	70	50	263,000 #	NONE	15'-6"	4	22,756	37	5,771	34	4,806
MEDFORD BRANCH (WELLINGTON TO MEDFORD)	1.1	1.1	0	0.27%	5°44'	2	1	0	40	10	263,000 #	NONE	16'-3"	0	1	10	2,224	0	-
NEWBURYPORT BRANCH (NAKESFIELD TO TOPSFIELD)	15.5	15.5	0	1.17%	8°50'	34	2	3	35	20	220,000 #	NONE	15'-9"	0	1	14	2,285	0	-
50 MIDDLETON BRANCH (W. PEARBODY TO 50 MIDDLETON)	3.0	3.0	0	0.59%	3°00'	6	1	1	35	10	220,000 #	NONE	15'-9"	0	1	2	60	0	-
WOBURN BRANCH (WINCHESTER TO WOBURN)	2.0	2.0	2.0	1.05%	7°15'51"	5	1	2	45	25	263,000 #	NONE	15'-0"	0	1	7	341	41	1,172
STONEHAM BRANCH (MONTVALE TO STONEHAM)	2.3	2.3	0	1.40%	9°36'	14	2	1	30	10	263,000 #	NONE	18'-0"	0	1	3	780	0	-
WILMINGTON JCT BRANCH (WILMINGTON TO WILMINGTON JCT.)	3.2	3.2	3.2	0.33%	9°00'	4	0	0	40	30	263,000 #	NONE	-	2	11,318	0	2	454	0
BILLERICA BRANCH (N. BILLERICA TO BILLERICA)	2.5	2.5	0	1.04%	9°30'	5	0	1	30	10	263,000 #	NONE	-	0	1	2	19	0	-
BOSTON AND MAINE CORPORATION																			
NORTHEAST SECTOR																			
EASTERN ROUTE MAIN LINE (BOSTON TO NEWBURYPORT)	37.3	58.8	48.3	0.96%	4°00'	43	29	24	60	50	220,000 #	NONE	15'-9"	0	2	59	21,805	32	3,968
SADGUS BRANCH (EVERETT JCT. TO W. LYNN)	9.5	10.7	0	0.86%	5°50'	31	6	3	45	20	263,000	NONE	15'-9"	0	1	20	1,564	0	-

* INCLUDES SALEM TUNNEL

INVENTORY OF RAILROAD RIGHTS OF WAY

Location	Road Miles	Track Miles	Signaled Track	Max Grade	Max Curve	No. Grade Crossings	No. Overhead Bridges	No. Track Bridges	Line Speed		Freight Car Capacity	Locomotive Restrict	Min. O.H. No.	Thru Freight Carloads	No. Local Freight Daily	Annual Carload Customers	Pass. Trains Daily	Total Daily Pass. Customers	
									1957	1972									
BOSTON AND MAINE CORPORATION																			
NORTHEAST SECTOR (CONT'D)																			
E. BOSTON BRANCH (REVERE TO E. BOSTON)	2.0	2.0	0	0.40%	6°45'	1	2	0	25	10	263,000 #	NONE	15'-9"	0	-	1	5	107	0
MARBLEHEAD BRANCH (SALEM INDUSTRIAL SPUR)	1.3	1.3	0	0.50%	5°00'	2	1	0	35	10	220,000 #	YES	17'-0"	0	-	1	2	2,999	0
DANVERS BRANCH (SALEM TO PEABODY & DANVERS)	5.1	5.1	0	1.05%	12°00'	9	8	6	45	20	220,000 #	NONE	15'-9"	0	-	1	16	2,275	0
SO READING BRANCH (PEABODY INDUSTRIAL SPUR)	3.1	3.1	0	0.90%	15°30'	7	0	0	20	20	220,000 #	NONE	15'-9"	0	-	1	12	1,106	0
GLoucester BRANCH (BEVERLY TO ROCKPORT)	16.6	28.6	28.6	1.09%	5°00'	26	6	9	60	30	220,000 #	NONE	15'-3"	0	-	1	6	510	26
MISCELLANEOUS LINES AND YARDS																			
LOWELL BRANCH (PC) (FRAMINGHAM TO LOWELL)	26.7	26.7	0	1.10%	7°03'	63	10	6	40	30	220,000 #	YES	16'-0"	0	-	1	15	1,289	0
FRAMINGHAM BRANCH (PC) (WANSFIELD TO FRAMINGHAM)	23.4	23.4	0	0.94%	2°30'	39	7	7	40	30	263,000 #	YES	16'-0"	2	15,600	1	13	4,093	0
BOSTON FREIGHT TERMINAL (PC)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11 SWITCHES	67	20,100	-
REARVILLE YARD (PC)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6 SWITCHES	13	10,500	-
FRAMINGHAM YARD (PC)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10 SWITCHES	7	19,270	-
BOSTON - SOMERVILLE OVERBRIDGE YARDS/MYSTIC BR. (B & M)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18 SWITCHES	72	32,236	-
NOTE 1:																			
WORCESTER TO FRAMINGHAM - 17'-7"																			
FRAMINGHAM TO BEACON PARK - 15'-0", 15'-10" ON TRACK																			
*2, 16'-8" FOR 8' WIDE PIGGYBACK																			
BEACON PARK TO SO. BOSTON - 15'-5"																			

PENN CENTRAL TRANSPORTATION CO.
INVENTORY OF FREIGHT CUSTOMERS

<u>Line</u>	<u>No. of On-Line Customers</u>	<u>Total Annual Carloads</u>	<u>Approx. Total Employment</u>	<u>Approx. Land and Building Value</u>
Dedham Branch	4	109	150	\$ 650,000
Dorchester Branch	4	660	350	2,500,000
E. Bridgewater Branch	6	65	100	900,000
Franklin Branch	3	1,665	2,800	17,800,000
Grand Jct. Branch	47	15,450	4,700	76,900,000
Holliston Branch	7	591	250	13,300,000
Main Line (B&A)	21	13,327	2,900	17,000,000
Middleboro Branch	50	7,117	3,400	20,800,000
Milford Branch	3	1,560	100	250,000
Millbury Branch	2	53	2,700	8,400,000
Milton Branch	6	814	350	2,000,000
Nantasket Branch	9	3,753	800	55,400,000
Needham Branch	18	3,117	1,600	12,700,000
Newton Lower Falls Br.	2	90	20	600,000
Randolph Branch	4	234	80	3,000,000
Plymouth Branch	20	2,018	900	7,600,000
Saxonville Branch	17	2,575	2,200	21,300,000
Shore Line	19	4,671	3,300	22,500,000
Stoughton Branch	12	1,681	1,000	2,400,000
W. Hanover Branch	2	298	50	500,000
Wrentham Branch	<u>11</u>	<u>3,224</u>	<u>3,600</u>	<u>10,300,000</u>
TOTAL	267	63,072	31,350	\$296,800,000
Boston Freight Term.	57	20,100	-	-
Readville Yard	13	10,500	-	-
Framingham Yard	7	19,220	-	-
Lowell Branch	15	1,289	-	-
Framingham Branch	<u>13</u>	<u>4,093</u>	-	-
GRAND TOTAL	372	118,274	-	-

BOSTON AND MAINE CORPORATION

INVENTORY OF FREIGHT CUSTOMERS

<u>Line</u>	<u>No. of On-Line Customers</u>	<u>Total Annual Carloads</u>	<u>Approx. Total Employment</u>	<u>Approx. Land and Building Value</u>
Bemis Branch	8	1,376	2,400	\$ 11,800,000
Billerica Branch	2	19	10	150,000
Central Mass. Branch	21	963	700	11,300,000
Danvers Branch	16	2,275	1,600	7,200,000
E. Boston Branch	5	107	50	20,500,000
Eastern Main Line	59	21,805	7,400	71,400,000
Fitchburg Main Line	37	7,260	1,500	25,500,000
Freight Cut-Off	5	1,118	600	7,000,000
Gloucester Branch	6	510	250	2,400,000
Lexington Branch	14	1,515	250	2,900,000
Marblehead Branch	2	2,999	2,100	1,700,000
Medford Branch	10	2,224	400	14,800,000
Mystic Branch	9	4,868	700	45,000,000
Newburyport Branch	14	2,285	350	6,700,000
New Hampshire M.L.	37	5,771	2,100	21,500,000
Saugus Branch	20	1,564	1,000	9,900,000
So. Middleton Branch	2	60	350	1,150,000
So. Reading Branch	12	1,106	1,000	11,000,000
Stoneham Branch	3	780	500	3,900,000
Watertown Branch	14	1,292	2,700	16,000,000
W. Route M.L.	42	2,917	3,100	41,800,000
Woburn Branch	<u>7</u>	<u>341</u>	<u>80</u>	<u>1,500,000</u>
TOTAL	345	63,155	29,140	\$335,100,000
Boston/Somerville/ Cambridge Yards	<u>63</u>	<u>27,368</u>	-	-
GRAND TOTAL	408	90,523	-	-

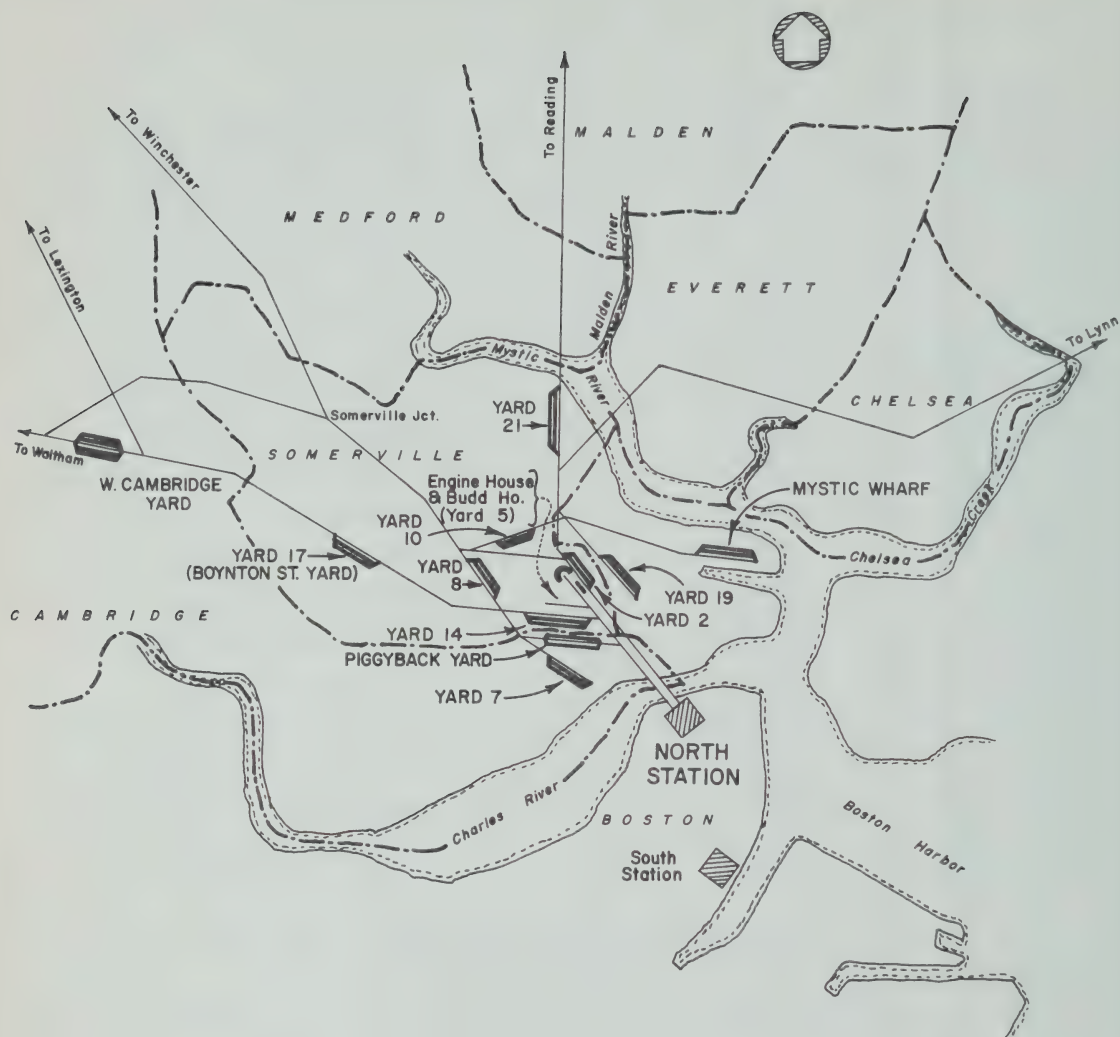
YARD AND SERVICING FACILITIES

BOSTON AND MAINE CORP.

<u>Facility</u>	<u>Location</u>	<u>Purpose</u>
W. Cambridge Yard	Cambridge	Indus. Switching & Class.
Piggyback Yard	Cambridge & Somerville	Piggyback Loading, Unloading & Storage
Yard #7	Cambridge	Industrial Switching
Boylnton St. Yd.	Cambridge & Somerville	Indus. Switching & Storage
Mystic Wharf Yd.	Charlestown	Indus. Switching & Storage
W. Lynn Yard	Lynn	Indus. Class. & Switching
B&M System Shops	No. Billerica	Car & Loco. Repair & Service
Salem Yard	Salem	Indus. Class. & Switching
Yard #8	Somerville	Class & Marshalling
Yard #10	Somerville	Industrial Switching
Yard #14	Somerville	Car Storage & Switching
Yard #19	Somerville	Industrial Switching
Yard #21	Somerville	Indus. Switching & Pub. Del.
Yard #5	Somerville	Car & Loco. Repair & Service
Waltham Yard	Waltham	Industrial Switching
Montvale Yard	Woburn	Industrial Switching

NO. OF YARD SWITCHERS (Daily Tricks)

Boston Yards	18
Chelsea	1
Lynn	1
Salem	<u>2</u>
	22



T
 LOCATION OF YARD FACILITIES
 CORE AREA

BOSTON AND MAINE CORP.

Thomas K. Dyer, Inc.

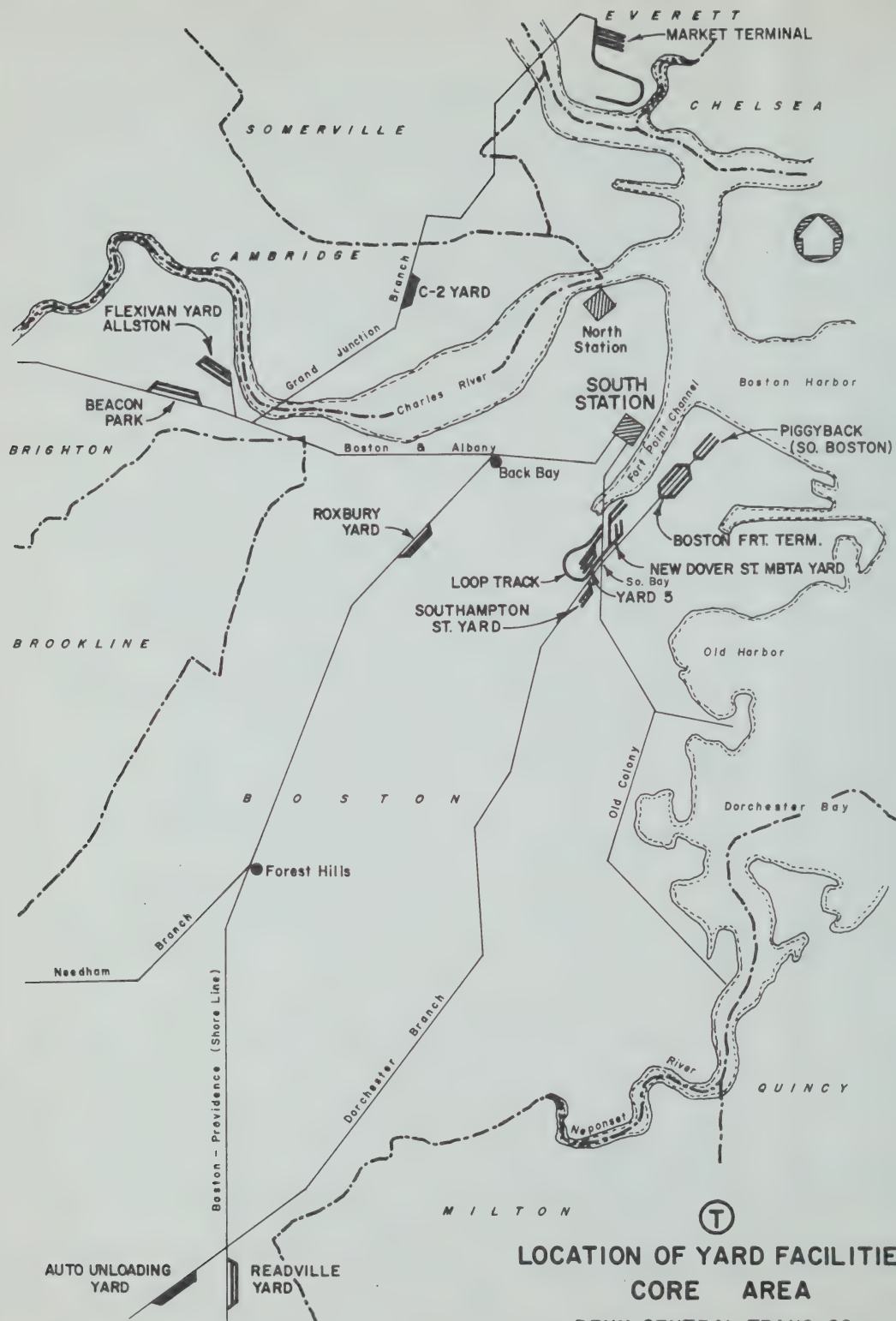
YARD AND SERVICING FACILITIES

PENN CENTRAL TRANSPORTATION CO.

<u>Facility</u>	<u>Location</u>	<u>Purpose</u>
Beacon Park	Allston	Classification & Indus. Switching and equipment servicing
Flexivan Yard	Allston	Flexivan Loading & Unloading
Brockton Yard	Brockton	Indus. Switching & Pub. Del.
C-2 Yard	Cambridge	Public Delivery & Storage
Market Terminal	Chelsea-Everett	Industrial Switching
Framingham Yard	Framingham	Class., Switching & Pub. Del.
Public Delivery	Framingham	Automobile Unloading & Storage
Mansfield Yard	Mansfield	Public Delivery & Storage
Middleboro Yard	Middleboro	Public Delivery & Storage
Readville Transfer	Readville	Classification & Indus. Switching
Public Delivery	Readville	Automobile Unloading & Storage
Roxbury Yard	Roxbury	Public Delivery
Boston Freight Terminal	So. Boston	Industrial Switching
Piggyback Yard	So. Boston	Piggyback Loading, Unloading & Storage
Southampton St. Yard	So. Boston	Public Delivery
Yard #5	So. Boston	Passenger Storage (AMTRAK)
So. Braintree Yard	So. Braintree	Indus. Classification & Switching
Public Delivery	Westboro	Automobile Unloading & Storage

NO. OF YARD SWITCHERS (Daily Tricks)

So. Boston Freight Term.	11
Readville	6
Beacon Park	9
Framingham	10
Braintree	<u>1</u>
	37



**LOCATION OF YARD FACILITIES
CORE AREA**

PENN CENTRAL TRANS. CO.

Thomas K. Dyer, Inc.

SOUTH STATION PASSENGER TERMINAL

South Station is presently served by ten station tracks. Nine of the tracks are adjacent to five eighteen-foot wide station platforms. Station platforms range from 760 to 1070 feet long. Rail traffic in and out of the station tracks is controlled by an interlocking signal and switch tower #1, located about 200 feet beyond the station platforms. Overhead signal bridges spanning the tracks at the outer end of the station platforms govern movements from the station and limit the length of trains which can be stored on station tracks.

The existing South Station building provides passenger concourse and waiting room area, ticketing and baggage facilities, rest rooms, and access to public streets and the MBTA Red Line. Quarters and offices for train and other Railroad personnel, train dispatchers, and communication facilities are also in the station building.

There are thirty-two (32) suburban trains and eleven (11) New York trains, or a total of forty-three (43) trains in each direction daily, serving South Station. The eleven New York trains are operated by the Railroad for AMTRAK. The majority of the suburban trains are operated by the Railroad for the MBTA.

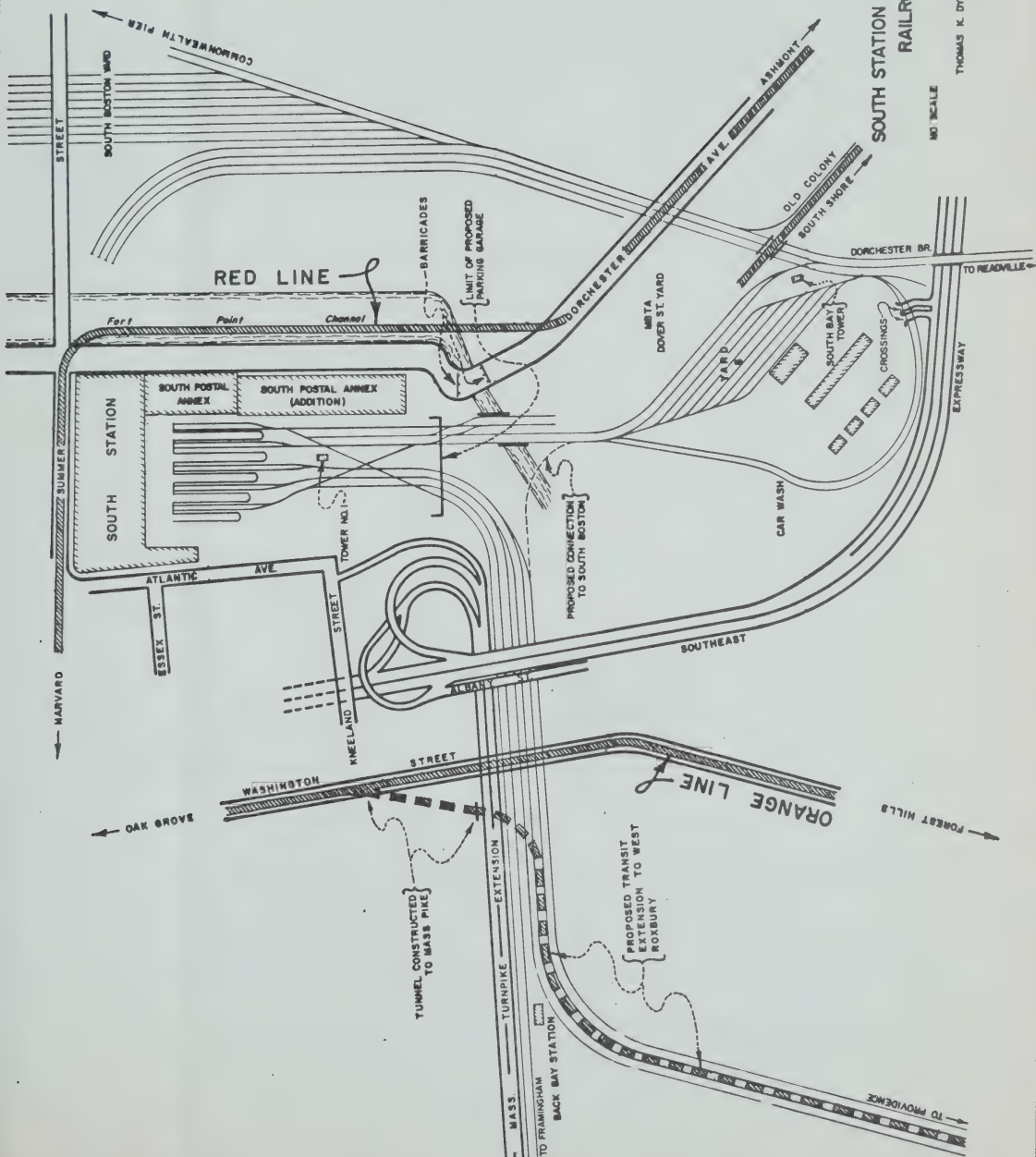
Car cleaning, light repairs, car washing, and car storage to the extent handled in Boston is done in the Station and at Yard 5 across the Ft. Point Channel from South Station. A loop track in this same area permits turning of trains. The car washer is located on the loop track. The nearest fueling facilities are located at Beacon Park in Allston on the former Boston & Albany main line. Insofar as possible, fueling is done outside of Boston at Providence,

New Haven, etc.

The daily passenger volume to Boston is about 6200 per day each way, divided 13% AMTRAK and 87% suburban service. Boston passengers divide approximately 65% South Station and 35% Back Bay.

South Station, including station tracks, signals, platforms, and other facilities, is owned by the Boston Redevelopment Authority. Track and platform facilities are rented from the Authority by the Terminal Corporation (a wholly owned subsidiary of the Railroad) and the South Station Building is managed by the Terminal Corporation which pays the difference between building income and building costs (when cost exceeds income, as at present).

The total land area of the Station and tracks is 23.7 acres.



(T)

SOUTH STATION TRANSPORTATION CENTER RAILROAD FACILITIES

AUGUST 1972

NO SCALE

THOMAS K. DYER, INC. LEXINGTON, MASS.

NORTH STATION PASSENGER TERMINAL

The North Station is served by ten tracks each adjacent to one of five eighteen foot wide station platforms. Platforms, as originally constructed, could accommodate 10 cars per track but during recent refurbishment were cut back so as to provide six car lengths each on four platforms and eight car lengths on the remaining one. Train movements in and out of the station tracks, over a two span four track bascule drawbridge, are controlled from an interlocking signal and switch tower just north of the drawbridge.

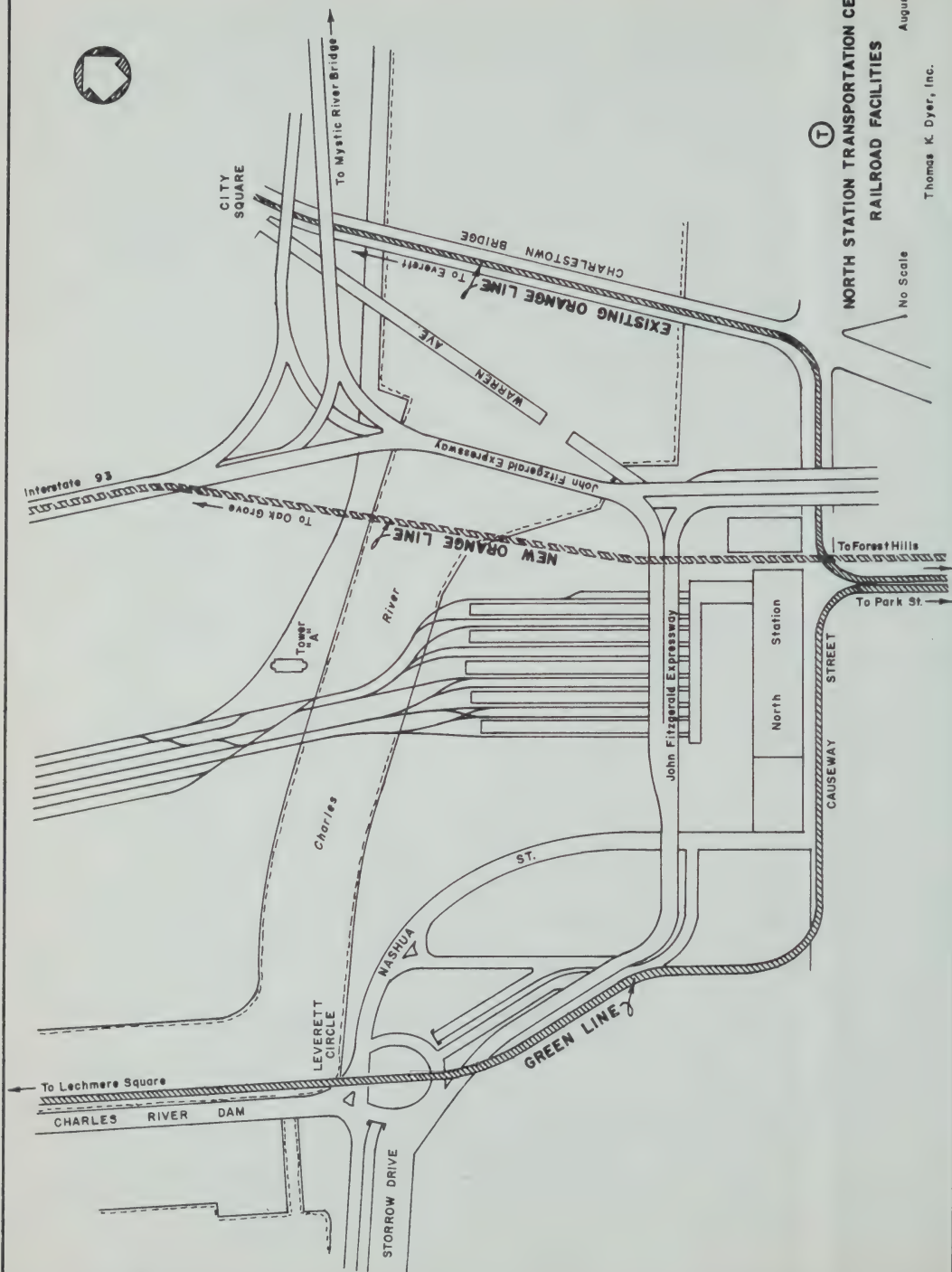
Railroad facilities now located in the North Station building consist of a concourse, waiting room, restrooms, ticketing facilities, and access to public streets and the MBTA Orange and Green Lines. In addition, there are several offices for railroad personnel.

Passenger service is limited to commuter trains operated by the railroad under an agreement with the MBTA. Presently there are 237 trains per weekday in and out of the North Station handling approximately 10,700 passengers daily in each direction. The passenger fleet used on the Boston and Maine is composed exclusively of Budd Cars.

Car cleaning, light repairs, car washing, fueling, and sanding is performed in the so-called Boston Engine Terminal area located in Somerville approximately one mile from the North Station.

The track and platform complex is located on 4 acres of land of the Boston and Maine Corporation while the North Station building and access ways to the platforms, are owned by a private realty trust which leases to the Railroad that portion of the building together with necessary ingress and

egress between tracks and public streets , required for the operation of the commuter railroad. The railroad is totally reimbursed by the MBTA for all expenditures occasioned by this lease.



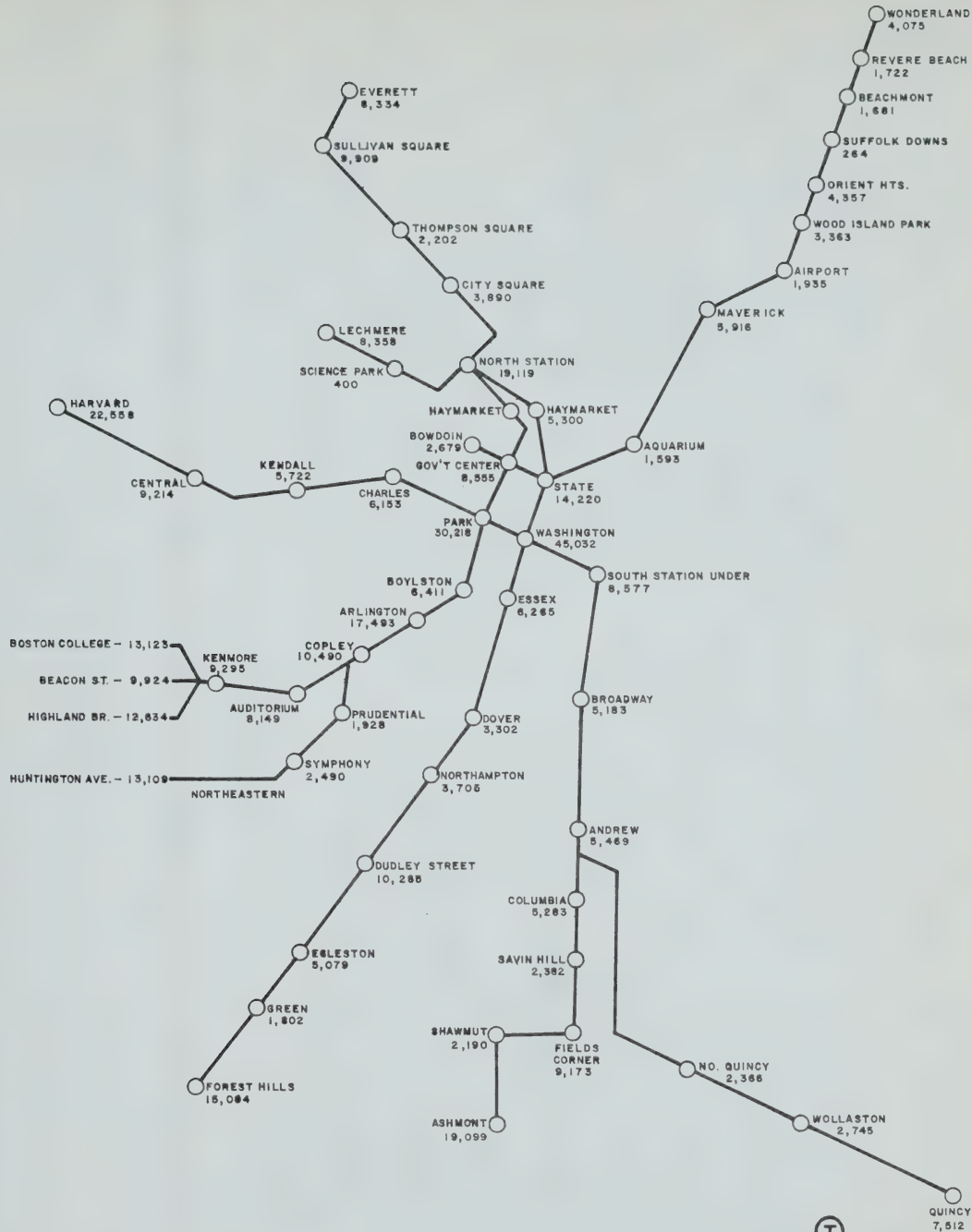
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**NORTH STATION TRANSPORTATION CENTER
RAILROAD FACILITIES**

No Scale

August 1972

Thomas K. Dyer, Inc.



ONE WAY TRAFFIC

Admitted At

RAPID TRANSIT LINES STATIONS

And At

SUBWAY ENTRANCES

FEB. 1, 1971

Thomas K. Dyer, Inc.

FORMER B & A MAIN LINE

SOUTH
STATION

WORCESTER
TP-13, PC-0

NATICK
TP-68, PC-0

WELLESLEY HILLS
TP-60, PC-40

RIVERSIDE
TP-0, PC-28

WEST NEWTON
TP-33, PC-0

TP 639

FRAMINGHAM
TP-135, PC-0

WELLESLEY
TP-123, PC-150

WELLESLEY FARMS
TP-95, PC-35

AUBURNDALE
TP-44, PC-40

NEWTONVILLE
TP-68, PC-0

TP 4278

TOTAL TO SOUTH
STATION AND
BACK BAY-4,917

NEEDHAM HTS.
P-5, KR-8
W-42, PC-15

NEEDHAM
P-23, KR-23
W-73, PC-55

BIRD'S HILL
P-74, KR-70
W-118, PC-105

TP 1268
NEEDHAM BRANCH

HIGHLAND
P-15, KR-13
W-65, PC-60

ROSLINDALE
P-47, KR-10
W-144, PC-175

NEEDHAM JCT.
P-116, KR-54
W-82, PC-150

W. ROXBURY
P-31, KR-20
W-108, PC-80

BELLEVUE
P-34, KR-13
W-80, PC-45

MOUNT HOPE
P-3, KR-1
W-12, PC-0

HYDE PARK
P-36, KR-19
W-99, PC-100

LINE

TP 811

ENDICOTT
P-36, KR-45
W-104, PC-15

RUSTCRAFT
P-0, KR-0
W-0, PC-0

ISLINGTON
P-18, KR-16
W-35, PC-15

FRANKLIN BRANCH

NORWOOD
P-42, KR-21
W-40, PC-25

NORWOOD CENTRAL
P-78, KR-88
W-37, PC-100

WINDSOR GARDENS
P-0, KR-1
W-77, PC-0

PLIMPTONVILLE
P-0, KR-2
W-2, PC-5

WALPOLE
P-15, KR-21
W-6, PC-25

NORFOLK
P-15, KR-4
W-14, PC-30

FRANKLIN
TP-94, PC-80

SHORE

ROUTE 128
P-360, KR-137
W-3, PC-694

TP 342
STOUGHTON BRANCH

CANTON JCT.
P-166, KR-138
W-66, PC-200

CANTON
P-2, KR-4
W-16, PC-50

STOUGHTON
TP-320, PC-60

SHARON
P-156, KR-94
W-55, PC-250

E. FOXBORO
TP-10, PC-15

MANSFIELD
TP-270, PC-55

ATTLEBORO
TP-203, PC-0

LEGEND

- P - Passengers from Parked Cars
- KR - Kiss and Ride
- W - Passengers Walking In
- PC - Parking Capacity
- TP - Total Passengers

PENN CENTRAL TRANSPORTATION COMPANY
INBOUND SUBURBAN PASSENGER COUNT
AND
PARKING CAPACITY

AUGUST 1972

Thomas K. Dyer, Inc.

RAILROAD FREIGHT SERVICE AND FACILITY REQUIREMENTS

General

Existing railroad rights-of-way represent a valuable asset in the Metropolitan area for rail passenger and freight service and/or utility corridors. The vertical and horizontal alignment and relatively few crossings at grade of railroad rights-of-way cannot be duplicated in urban areas without substantial capital investment, major relocation of homes and industry with resulting sociological impacts and increased project time for right-of-way acquisition and construction. The thirty-year trend of declining railroad service in the Northeast, due in large part to the growth of the highway system and the automotive and trucking industries, has resulted in rail mergers, abandonment of facilities and rights-of-way, and bankruptcy of the major railroads serving the Boston Area.

Several rights-of-way were abandoned which might have been of considerable value as transportation or utility corridors. Unfortunately, their potential value was not foreseen and most of them were disposed of to various owners, usually abutters, destroying the right-of-way continuity. The map on the following page shows the location of several of these abandoned rights-of-way.

The reorganization proceedings to date of both the Penn Central and the Boston and Maine have indicated liquidation of surplus facilities and sale of rights-of-way will be a part of any reorganization plan.

The realization of both the public and government that increased mass transportation in most urban areas is important to a balanced transportation

system, efficient land utilization, and environmental improvements coupled with a possible surplus of railroad rights-of-way, suggests the need for an evaluation of existing railroad corridors for use in a long term mass transportation plan.

In order to determine the availability and economics of railroad rights-of-way for mass transportation service, it is necessary to analyze the existing and future need of railroad rights-of-way for rail freight service in the Boston Area.

Existing Study Area Railroad Freight System

Freight cars destined for the Study Area from origins throughout the United States and Canada are brought into the area on "through" freight trains on four rights-of-way.

On the Penn Central, 18 through freights operate on the New Haven Shore Line and the Boston and Albany line bringing cars to the major classification yards within the Study Area located at So. Braintree, Readville and South Boston and Framingham and Beacon Park. At these yards, freight cars are divided by the lines for which the cars are destined. Local freight trains then place the loaded cars or empty cars for loading on the side tracks of the individual freight customers. Local freight trains also pick up empty cars or loaded cars which originate from customers in the Study Area and take them to the major classification yards to be assembled into outbound through freight trains taking cars from the Study Area to destinations outside the Study Area. Several local freights serving customers on lines within the

Study Area originate from classification yards outside the area, i.e., Providence and Worcester. One hundred eighteen thousand (118,000) carloads annually originate or terminate in Penn Central territory in the Study Area.

On the Boston and Maine, 12 through freights operate on the Fitchburg Main Line and the New Hampshire Main Line (connecting to the Portland Main Line via Wilmington to Wilmington Jct.) bringing cars to the major classification yards within the Study Area located at West Cambridge and Boston (Yard 8). Local freight trains then place the loaded cars, or empty cars for loading, on the side tracks of individual freight customers. Local freight trains also collect empty cars and outbound loaded cars from freight customers for outbound through freight trains. Several local freight trains serving customers on lines within the Study Area originate from switching yards outside the area, i.e., Lowell and Lawrence. Ninety-one thousand (91,000) carloads annually originate or terminate in Boston and Maine territory in the Study Area.

In addition to the major classification yards mentioned above for the two railroads, there are several smaller classification yards to perform additional classification work not carried out at the major facilities. Yard switching engines which separate cars by destination on classification tracks also place cars on freight customer side tracks located within yard territory.

In addition to classification yards, special facilities are located in the Study Area such as: piggyback yards where highway trucks and containers can be loaded and unloaded from rail cars; public delivery tracks where the

general public can ship and receive freight by rail; public delivery tracks with ramps for unloading auto rack cars; and car and locomotive servicing and repair facilities.

A summary of freight trains and yard switchers serving the Study Area, the annual carloads originating and terminating in the Area and annual freight revenue of these carloads is as follows:

	<u>B&M</u>	<u>PC</u>	<u>TOTAL</u>
No. of Through Freights	12	18	30
No. of Local Freights	10	19	29
No. of Yard Switchers	22	37	59
Annual Carloads orig. and term. in Study Area	91,000	118,000	209,000
Estimated Annual Revenue*	\$17,000,000	\$36,000,000	\$53,000,000

*Estimated from average system revenue per car of each carrier for 1971.

Future Study Area Railroad Freight System Requirements

Freight carloads originating and terminating within the Study Area have been declining steadily over the last twenty years, although accurate figures are difficult to obtain as the Railroads do not keep records for this Area in a usable form. However, there are many indicators which can be used to estimate the extent of the decline. A review with Railroad personnel of cars arriving daily in Boston, number of through freights operated, Boston yard switcher tricks, and cars handled on the more heavily loaded local freights indicates a reduction in carloads of about seventy percent since 1952.

The downward trend in rail freight in the Study Area appears to be primarily the result of the decline of heavy industry in Massachusetts and the rapid growth of the trucking industry spurred by the construction of the highway system. In addition, urban renewal programs and planning in Boston as in most other cities have not encouraged the principal users of rail freight service since warehouses, product distribution centers, and manufacturing-type construction do not provide the property tax income of high-rise developments. This policy has contributed to the steady movement of material distribution and manufacturing operations out of the core city area. With the loss of rail-oriented industries the core city has lost blue collar jobs while increasing the need for white collar workers in new office buildings. This change in the pattern of employment opportunities appears somewhat contrary to the location of the labor market and may have significance in passenger transportation requirements in the future.

Both the Boston and Maine and the Penn Central have reduced the number of cars brought into their Boston classification facilities for distribution from Boston in order to improve operating efficiency and reduce costs. Cars on the B & M, which in past years would have come into Boston for classification and distribution by Boston-based local freights, are now handled at Lowell, Lawrence, West Cambridge, and other outlying yards. On the Penn Central, similar operating changes have occurred, resulting in the Plymouth Branch, Nantasket Branch, and Middleboro Branch being served out of Providence rather than Boston, and on the Boston and Albany line an increase in the number of car handled out of Framingham and Worcester rather than Boston.

The decline in carload freight entering the Study Area combined with operational changes in the freight service have resulted in a major reduction in terminal and classification facilities in the Core Area (i.e., Boston, Cambridge, Somerville, Everett, Chelsea). It appears both Railroads will eliminate major classification work done in the Core Area over the next few years permitting a further reduction in terminal and classification facilities.

The transportation inventory taken in this study indicates of the 209,000 carloads annually originating or terminating in the Study Area, 172,000 are handled in the Core Area classification facilities. Ninety-one thousand (91,000) carloads originate or terminate in the Core Area, the remaining 81,000 cars are classified in the Core Area terminal facilities for placement by local freights originating from the Core Area terminal facilities for placement to freight customers outside the Core Area. (See Table on following page.)

The total volume of cars, loads and empties now entering and leaving the Core Area on through freight trains over four existing lines is estimated as follows:

	<u>LOADS</u>	<u>EMPTYES</u>	<u>TOTAL</u>
Inbound	114,000	36,000	150,000
Outbound	<u>58,000</u>	<u>92,000</u>	<u>150,000</u>
	172,000	128,000	300,000

The total cars moving presently into the Core Area on four lines amounts to an average of only 500 cars per day one way which is considerably less

DISTRIBUTION OF FREIGHT CARS IN THE CORE AREA

	<u>B & M</u>	<u>P C</u>	<u>TOTAL</u>
Through freight annual carloads in and out of Core Area			
via Fitchburg Main Line	68,000	--	
via New Hampshire Main Line	23,000	--	
via Boston & Albany Main Line	--	56,000*	
via Shore Line and (Dorchester Br.)	<u>--</u>	<u>25,000</u>	
TOTAL	91,000	81,000	172,000
Annual Carloads originating and terminating in Core Area			
Boston-Somerville Yards	27,000	--	
Cambridge-W. Cambridge	5,000	--	
Medford Branch-Edgeworth	4,000	--	
South Boston	--	20,000	
Readville	--	10,000	
Beacon Park	--	10,000	
Grand Jct. Branch	<u>--</u>	<u>15,000</u>	
SUB-TOTAL	36,000	55,000	91,000
Annual Carloads Classified in the Core Area, Terminal Facilities for freight Customers outside the Core Area	<u>55,000</u>	<u>26,000</u>	<u>81,000</u>
TOTAL	91,000	81,000	172,000

*Includes 21,000 cars to and from Boston via Framingham and Dorchester Branch.

than half the capacity of one track.

Consolidating through-freight trains onto fewer lines would both increase Railroad efficiency and provide more availability of rights-of-way for mass transportation purposes. Reduction in the rights-of-way used for through-freight trains can be accomplished by revising service and physical facilities as follows:

1. Consolidation of Penn Central Through-Freight Service Onto the Boston & Albany

The major classification facility of the Penn Central for the Northeast is the Alfred E. Perlman Yard at Selkirk, New York, located at the west end of the Boston & Albany. This new electronic yard was built in the late 1960's to consolidate Penn and New York Central classification of freight cars for New York and New England into one modern facility.

Since the merger of the New Haven into the Penn Central system, the movement of freight to the Study Area via Selkirk and the Boston & Albany has been encouraged rather than via the Shore Line. At present, close to half the freight going to the New Haven's Readville and South Boston Yards moves over the Boston & Albany via Framingham to the Franklin and Dorchester Branches. The movement to South Boston could be made more efficiently if a direct connection were installed between the Boston & Albany and South Boston at South Station.

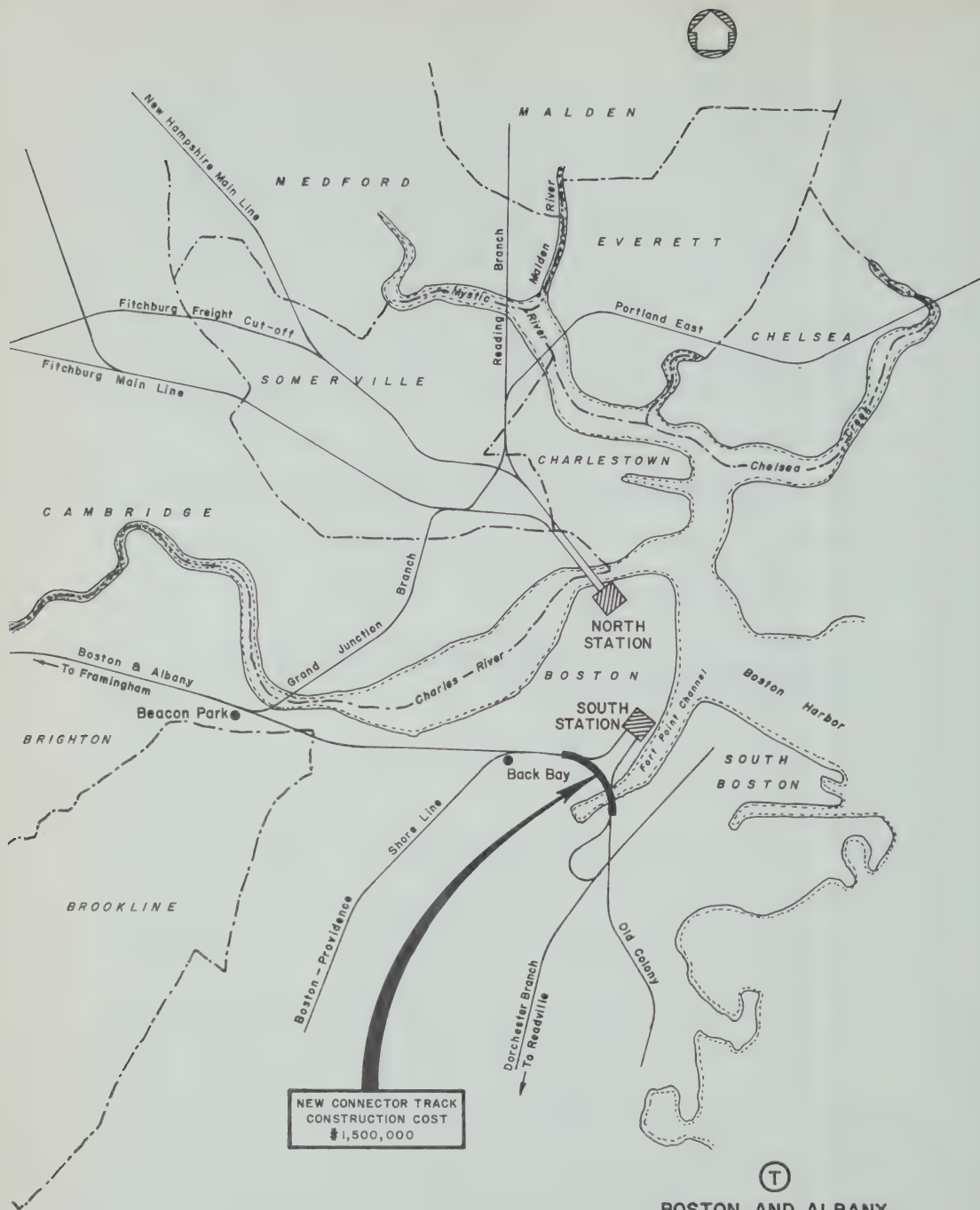
This connection would eliminate dropping South Boston cars off at Framingham to be moved via Walpole to Readville and thence to South Boston over the Dorchester Branch. The connection is shown schematically on the

map on page 44. In addition to construction of the track, new crossovers and interlocking controls are required, a structure to carry the track over Fort Point Channel, and overhead clearance improvement between Beacon Park and South Station.

The estimated cost of the new connector and improved clearances is \$1,500,000, exclusive of land acquisition. Construction of the connector and consolidation of through-freight service onto the Boston & Albany would eliminate through-freight service on the Shore Line and the Dorchester Branch. Freight cars destined for Readville could move via Framingham and the Franklin Branch.

2. Consolidation of Boston and Maine Through-Freight Service
Onto the New Hampshire Main Line

Seventy-five percent of the Boston & Maine through-freight carloads now move over the Fitchburg Main Line and the Fitchburg Freight Cut-off to and from Boston. The remaining through freights enter Boston over the New Hampshire Main Line. The route to Boston of the Fitchburg Main Line to Ayer, the Stony Brook from Ayer to Lowell and the New Hampshire Main Line from Lowell to Boston is only 4.40 miles longer than the route via the Fitchburg Main Line and Fitchburg Freight Cut-off. To consolidate the through-freight service on the New Hampshire Main Line requires an increase in the clearances between Lowell and Boston to equal the clearances via the Fitchburg Main Line. The estimated cost of clearance improvements is \$500,000.



BOSTON AND ALBANY
CONNECTION TO SOUTH BOSTON

JULY 1972

Thomas K. Dyer, Inc.

3. Consolidation of the Boston and Maine and Penn Central Through-Freight Service on the Boston & Albany Main Line

The capacity of the Boston & Albany double track main line is more than adequate for the through-freight service of both railroads with an adequate margin for peaks or future increase in rail freight to the Boston Area. The Grand Jct. Branch connects the Boston & Albany to the Boston and Maine. (See map on page 44). The only physical changes required to consolidate the through-freight service on the Boston & Albany line are clearance improvements between Framingham and Beacon Park and to the junction of the Fitchburg Main Line and the Grand Jct. Branch. The clearance improvements are estimated to cost \$1,400,000.

Adding the Boston and Maine traffic to the Grand Jct. Branch will result in an estimated 85,000 cars annually in each direction, or an average of 280 cars per day each way. The line has more than adequate capacity for this volume of freight. However, there are six grade crossings between Beacon Park and the Boston and Maine including Massachusetts Avenue at MIT, Main Street and Broadway at Kendall Square, Cambridge Street and Medford Street. The majority of traffic can move at night relieving the grade crossing problem substantially. However, it is recommended grade crossing elimination funds be made available to grade separate these crossings. The estimated cost to eliminate the six crossings at grade is approximately \$40,000,000.

Routing Boston and Maine traffic via the Penn Central's Boston &

Albany line and the Grand Jct. Branch can be accomplished by merger of the two Railroads, establishment of a jointly managed Boston Area Terminal Railroad, or granting of trackage rights by the Penn Central to the Boston and Maine. Any of the above methods is possible, but either merger or joint operation of a Terminal Corporation would appear extremely difficult to achieve during bankruptcy reorganization. Both of these alternatives, particularly merger, appear contrary, also, to the policy of the Interstate Commerce Commission in maintaining two-railroad service into New England and the Study Area.

A trackage rights' agreement on an equitable basis appears more feasible and should reduce operating costs on both Railroads without affecting the quality of railroad freight service in the Study Area. It would appear increasing the classification work performed at East Deerfield and running Boston and Maine east/west traffic via the Boston and Maine's Connecticut River Line to Springfield and then on trackage rights over the Boston & Albany to Worcester and Boston may offer more advantages to the Boston and Maine than trackage rights from either Selkirk or Worcester. (See map on the next page.) There are several existing trackage rights' agreements on both Railroads which could be the basis for the proposed trackage rights of the Boston and Maine over the Penn Central's Boston & Albany line.

MILEAGE FROM ROTTERDAM JCT.

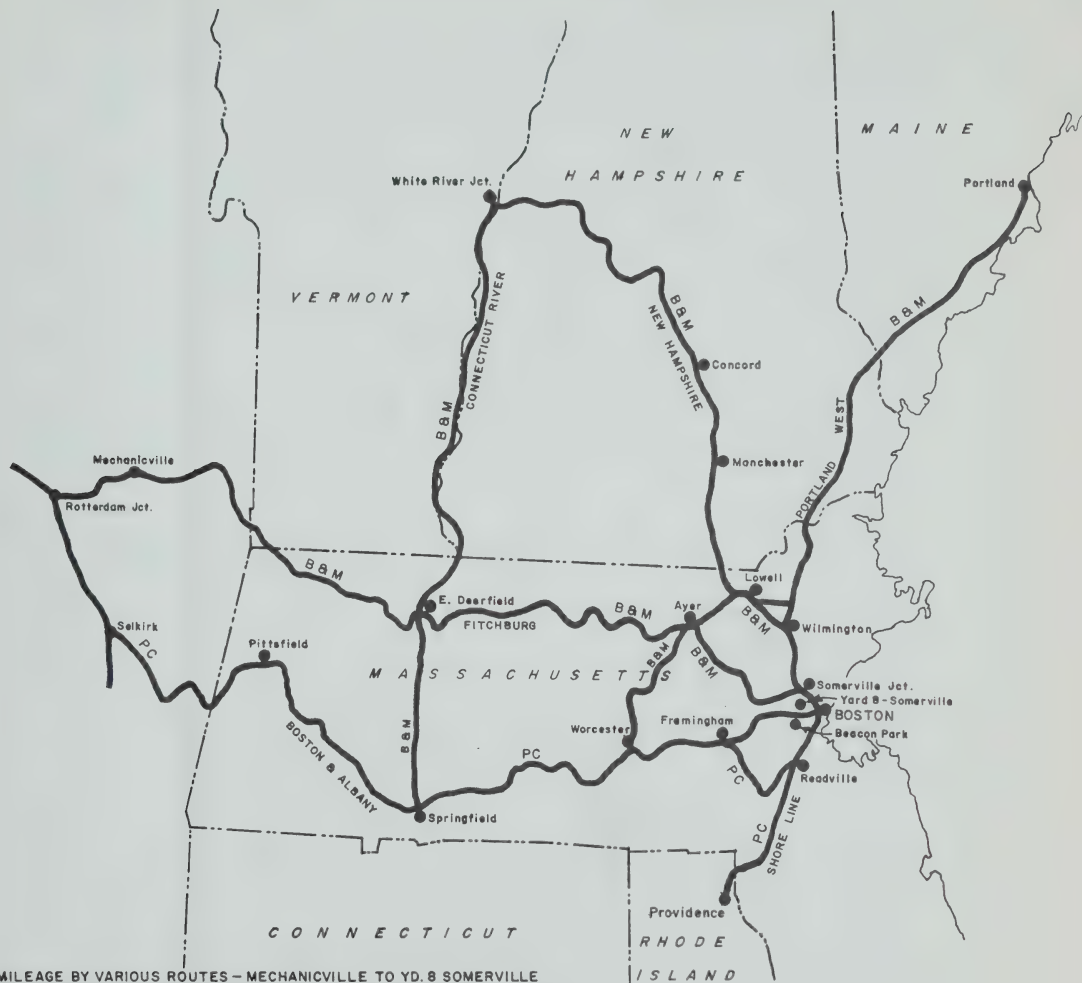
Rotterdam Jct. to Mechanicville - 21.2

Rotterdam Jct. to Selkirk - 25.0

Mechanicville to Selkirk - 46.2

Rotterdam Jct. to Yd. 8 via Fitchburg M.L. - 208.5

Rotterdam Jct. to Beacon Park via Boston & Albany - 216.1



MILEAGE BY VARIOUS ROUTES - MECHANICVILLE TO YD. 8 SOMERVILLE

	<u>Miles</u>	<u>Difference</u>
1. Mechanicville to W. Cambridge to Yd. 8 via Freight Cutoff	187.3	—
2. Mechanicville to Ayer to <u>Lowell</u> to Yd. 8 via New Hamp. M.L.	191.7	+ 4.4
3. Mechanicville to E. Deerfield to <u>Springfield</u> to Yd. 8 via Boston & Albany and Grand Jct. Branch.	218.7	+31.4
4. Mechanicville to Ayer to <u>Worcester</u> to Yd. 8 via Boston & Albany and Grand Jct. Branch	223.4	+36.1



THROUGH FREIGHT ROUTES TO BOSTON AREA

AUGUST 1972

Thomas K. Dyer, Inc.

RAILROAD PASSENGER SERVICE

The existing railroad passenger service operated to and from Boston by the Penn Central and the Boston and Maine consists of 325 trains daily, carrying close to 34,000 passengers (two-way totals). The majority of the service is financed by the Massachusetts Bay Transportation Authority (suburban) and AMTRAK (interstate).

A profile of the present passenger operations is contained in the Tables on the next four pages:

1. Daily train and passenger volumes by lines divided by the agency supporting the service. Also indicates service which cannot be eliminated without ICC approval. (Fall of 1971 train and passenger count.)
2. A breakdown of inbound passengers on MBTA subsidized suburban trains by lines and by means of transportation to the train (i.e., walk on, kiss-and-ride, park-and-ride.) Also, the number of parking spaces available by lines is included (Fall of 1971 Passenger Count).
3. 1971 Cost of MBTA subsidized service divided by lines and by type of cost, i.e., above rail, below rail, and overhead costs.
4. Railroad passenger equipment operating to and from Boston divided by Railroad and type of service. Also, pertinent statistics concerning Boston Station Terminals.

TRAIN AND PASSENGER VOLUMES BY LINES AND RESPONSIBLE AGENCIES

BOSTON AND MAINE

PENN CENTRAL

Item	Line	Two Way Daily Totals		Line	Two Way Daily Totals	
		No. of Trains	No. of Passengers		No. of Trains	No. of Passengers
① Suburban Trains Operated Solely by Agreement with MBTA	Fitchburg Main Line	40	2,566	Franklin Branch	13	1,622
	Lexington Branch	2	188	Needham Branch	23	2,536
	New Hampshire Main Line (Lowell)	34	4,806			
	Woburn Branch	41	1,172			
	Wilmington Jct. Branch (Haverhill)	2	454			
	Western Route Main Line	60	6,660			
② Suburban Trains with Expenses Divided between the Railroad and MBTA (ICC Approval needed for Discontinuance)	Eastern Route (to Newburyport)	32	3,968			
	Gloucester Branch	26	1,572			
	TOTAL	237	21,386	TOTAL	36	4,158
③ Suburban Trains Solely at Railroad Expense (ICC Approval needed for Discontinuance)		None	None	Shore Line	16	4,691
				Stoughton Branch	8	684
				TOTAL	24	5,375
④ AMTRAK Trains		None	None	Boston & Albany Main Line	6	1,278
		None	None	Shore Line	20	1,493
				Boston & Albany Main Line	2*	120
	TOTALS	237	21,386	TOTAL	22	1,613
					88	12,424

* Partially subsidized by State

Total Daily Trains (two ways) Both Railroads = 325

Total Daily Passengers (two ways) Both Railroads = 33,810

Thomas K. Dyer, Inc.

BREAKDOWN OF (T) SUBSIDIZED INBOUND PASSENGERS BY TYPE OF TRANSPORTATION TO RAILROAD

PENN CENTRAL

LINE	WALK ON	KISS & RIDE	PARK & RIDE	TOTAL	PARKING SPACE
Shore Line	257	399	718	1374	1344
Needham Branch	712	211	345	1268	685
Franklin Branch	315	198	204	717	215
Stoughton Branch	16	4	2	22	50
PC TOTALS	1300	812	1269	3381	2294*
% TOTAL RIDERS	38%	24%	38%		

BOSTON & MAINE

Fitchburg M.L.	464	226	294	984	393
Lexington Branch	59	22	13	94	225
New Hampshire M.L.	805	319	373	1497	440
Woburn Branch	355	120	111	586	107
Western Rte. M.L.	2051	594	685	3330	892
Eastern Rte. M.L.	825	455	497	1777	530
Gloucester Branch	210	116	113	439	223
B & M TOTALS	4769	1852	2086	8707	2810*
% TOTAL RIDERS	55%	21%	24%		

GRAND TOTAL	6069	2664	3355	12088	5104*
% TOTAL RIDERS	50%	22%	28%		

*In many cases parking spaces available to commuters are not reserved resulting in substantial non-railroad user parking.

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1971 COST OF MBTA SUBSIDIZED RAILROAD SUBURBAN SERVICE

LINE	1971 FARE PAYING PASSENGERS	1971 PASSENGER REVENUE	COSTS VARYING WITH SERVICE OPERATED ON A LINE		COSTS WHICH ARE RELATIVELY FIXED IF ANY SERVICE IS OPERATED ON THE SYSTEM	COSTS WHICH ARE RELATIVELY FIXED IF ANY SERVICE IS OPERATED ON THE SYSTEM
			Train Crew Wages Fuel and Train Supplies Equipment Maintenance and Ownership Costs.	ABOVE RAIL COSTS		
BOSTON AND MAINE						
Eastern	1,345,000	\$ 1,585,000		\$ 2,007,000	\$ 149,000	Maintenance of Tracks, Way, Signals and Structures Towerman Crossing Watchmen Station Agents
Reading	1,793,000	1,500,000		1,221,000	152,000	
New Hampshire (incl. Bedford and So. Sudbury)	1,528,000	1,797,000		1,823,000	101,000	
Fitchburg	590,000	736,000		882,000	143,000	
BOSTON AND MAINE TOTALS	5,256,000	\$ 5,618,000		\$ 5,933,000	\$ 545,000	\$ 3,071,000
PENN CENTRAL						
Needham	619,000	561,000		535,000	190,000	Maintenance of Tracks, Way, Signals and Structures Towerman Crossing Watchmen Station Agents
Franklin	419,000	488,000		482,000	168,000	
Canton-Sharon	786,000	751,000		688,000	346,000	
PENN CENTRAL TOTALS	1,824,000	\$ 1,800,000		\$ 1,705,000	\$ 704,000	\$ 1,389,000
BOTH RAILROADS TOTALS	7,080,000	\$ 7,418,000		\$ 7,638,000	\$ 1,249,000	\$ 4,460,000

S U M M A R Y

BOSTON AND MAINE		PENN CENTRAL		BOTH RAILROADS	
ABOVE RAIL COST	\$ 5,933,000	\$ 1,705,000	\$ 7,638,000		
PASSENGER REVENUE	5,618,000	1,800,000	7,418,000		
NET ABOVE RAIL COST	315,000	(95,000)	220,000		
BELOW RAIL COST	545,000	704,000	1,249,000		
OVERHEAD COST	3,071,000	1,389,000	4,460,000		
TOTAL COST LESS REVENUE(SUBSIDY)	\$ 3,931,000	\$ 1,998,000	\$ 5,929,000		
1971 REVENUE PASSENGERS	5,256,000	1,824,000	7,080,000		
NET COST/PASSENGER	\$ 0.75	\$ 1.10	\$ 0.84		

RAILROAD PASSENGER EQUIPMENT

Boston and Maine

84 Budd Cars

Penn Central

(a) New Haven Territory Suburban Service

10 Locomotives, 46 Coaches, 11 Budd Cars

(b) New Haven Territory AMTRAK

11 Locomotives, 38 Cars, 1 five-car Turbo Train

(c) Boston & Albany Suburban Service

3 Locomotives, 13 Coaches

(d) Boston & Albany AMTRAK

2 Locomotives, 13 Coaches

Approximate Value of Equipment New at 1972 Prices --

\$50,000,000.

BOSTON STATION TERMINALS

<u>Railroad</u>	<u>No. of Station Tracks</u>	<u>Total Length of Tracks Adjacent To Platform</u>	<u>Total No. of Trains Per Weekday</u>	<u>Total No. of Passengers Per Weekday</u>
Boston and Maine (North Station)	10	5,700	237	21,400
Penn Central (South Station)	<u>10</u>	<u>7,750</u>	<u>88</u>	<u>7,600</u>
Totals	20	13,450	325	29,000

Railroad Suburban Passenger Ridership Trend

From the late forties to the present, inbound weekday passengers to Boston (North and South Stations) have declined over 80% from 80,000 to under 15,000. The principal reason for the decline has been the substitution of the private automobile for public transportation. The increased use of the automobile resulted principally from the interaction of more and better cars, a booming economy, and the enormous public investment in roads and parking facilities. The drop in railroad ridership was hastened by the general decline of the railroad industry which resulted, by the late fifties, in a continuing pattern of service reductions, worsening employee morale, and deterioration of both track and equipment due to inability to provide the funds for maintenance and capital programs.

The expenditure of public funds to support both interstate and suburban railroad passenger services during the sixties appears to have halted the decline in ridership. Except for the Mass Transportation Commission demonstrations in 1962-1963 and the recent take-over by AMTRAK of intercity service, public funds have been used on a short term basis to prevent complete loss of railroad passenger service. The extent to which railroad suburban passenger volume can be increased by a long range program of capital investment in plant and equipment, improved and more frequent service, and an aggressive marketing and sales program is dependent on several factors. The decisions now pending by government on the role of, and public investment in, private and public transportation to and from the Core Area and the social and economic health and growth of Boston and the Core Area will affect potential

passenger volumes. However, the dispersement of homes away from rail lines with the resultant dependence on the automobile during the rapid growth of the suburbs since World War II makes the passenger volumes of twenty-five years ago appear unrealistic in the future.

The CRIP (Commuter Railroad Improvement Program) study on a program for continuing and improving railroad commuter service has forecast an increase in suburban passenger volume of over 40% by 1980 over 1971. The increased ridership forecast was based on the following assumptions:

1. A capital program to improve roadways, rolling stock, stations, and parking facilities.
2. A policy by the Commonwealth that emphasizes public transportation as the favored means of urban peak hour radial transportation and discourages the use of the automobile.
3. Service improvements are implemented including increased frequency and capacity, improved scheduling, and promotional fares.
4. A vigorous and effective management of the service.
5. An aggressive consumer-oriented marketing and sales program.
6. Emphasis on public transportation will generate 268,000 additional jobs by 1980, thereby increasing ridership.

Operating Cost of the Railroad Commuter Service

The contracts executed between the Massachusetts Bay Transportation Authority and the Railroads to subsidize commuter service were originally for a three-year period commencing January 1, 1965 for the Boston and Maine and a two-and-one-half year period for the New Haven commencing July 1965. Since 1968, the commuter railroad subsidy has been extended on a year-to-year basis by the Legislature up to the present expiration date of July 31, 1973.

The original contracts were based on an avoidable cost approach (i.e., actual costs which would not be incurred if subsidized service were discontinued) since the subsidy period was considered short term. The avoidable cost approach has continued on the Boston and Maine contract extensions, with few exceptions, up to the present.

The Penn Central (after merger with the New Haven) advised in 1969 that the subsidy could no longer be considered short-term and that a full-cost approach should be substituted for the avoidable cost contract. A study was made in 1969 of the annual cost on an allocation of full cost basis which resulted in a 15% increase in the estimated subsidy cost in 1970. An example of the difference between avoidable cost and allocated full cost is as follows:

An expense such as a crossing tender, which would be required for freight service as well as passenger service, is no charge on an avoidable cost basis; whereas on an allocated full cost basis, the expense is divided between the passenger and freight service in an equitable manner.

The proportionately higher below-rail cost on the Penn Central versus the

Boston and Maine contracts reflects the difference in allocated full cost versus avoidable cost.

The results of the cost distribution appear to indicate the variable costs (i.e., above rail costs) are substantially offset by passenger revenue and fixed costs (i.e., below rail costs and overhead costs) are subsidized. The preliminary conclusion would appear that provision of additional equipment, if proportionately increased ridership results, would not increase the subsidy cost and would decrease the subsidy cost per passenger. Also, reducing the service offered with proportionately reduced ridership will not significantly reduce the deficit and would increase the per passenger cost.

Intercity Rail Passenger Service

Intercity rail passenger service in the Northeast is now operated by AMTRAK. The lines presently being used in the Boston area by AMTRAK are: Boston and Providence main line for the Shore Line service to New York City (10 trains per day each way) and the Boston and Albany for the service to New York City via Worcester and Springfield (one train per day each way).

If high-speed rail service to New York City is progressed, the Boston and Providence Shore Line appears to be the feasible route, either via Back Bay or via the Dorchester Branch to Readville.

In addition to the lines now carrying intercity passenger traffic, consideration has been given to Boston-Portland service and Boston-Concord-Montreal service, both of which would utilize the Boston and Maine's New Hampshire Division (Boston-Winchester-Wilmington) in the Boston Area.

The only intercity passenger volume which might approach substantial right-of-way use by AMTRAK in the Boston Area would be the Boston-Providence line if high-speed rail service between Boston and New York is developed for dependable schedules in the two to two and one-half hour range.

Boston Railroad Passenger Terminals

A major renewal project by the Boston Redevelopment Authority is underway at South Station. A principal project objective is the construction of a new intermodal transportation terminal for rail, bus, transit, and automobile. The development plans a major bus terminal, 3,500-car parking garage over the South Station tracks, and a multi-modal concourse and ticketing area to be one level above the tracks with escalator access to and from each platform to the concourse area. A moving sidewalk is planned at concourse level to improve the movement of rail, bus, and parking garage patrons to and from the MBTA Red Line and Dewey Square.

The project is being coordinated with the planning of AMTRAK, the MBTA and the Commonwealth of Massachusetts.

There are no firm plans underway for major improvements to the rail terminal at North Station at this time.

USE OF RIGHTS OF WAY FOR MASS TRANSPORTATION PURPOSES

Rail Transportation Corridors

The commuter Railroads have provided radial transportation to and from Boston for many years over seven major rail corridors:

1. Old Colony - Boston to Quincy (now MBTA South Shore Line)
2. Shore Line - Boston to Providence
3. Boston & Albany - Boston to Worcester
4. Fitchburg - Boston to Ayer
5. New Hampshire - Boston to Lowell
6. Portland West - Boston to Haverhill (north of Reading now served by New Hampshire)
7. Portland East - Boston to Newburyport

The interaction of the Railroad and the communities on each other along the rail corridors is still very evident. Each of these corridors have, and/or had in the past, branch lines feeding into the main corridors.

Despite the major decline in patronage and service since World War II, 16,000 people enter Boston each day over the rail corridors via the commuter Railroads. While relatively small in number, neither the highway system nor parking facilities in Boston are adequate to take the commuter off the Railroad. Since the right-of-way capacity of the rail corridors is considerably in excess of the present service, unlike the highway-parking system, a more balanced transportation system will be achieved by encouraging mass transportation use of these corridors. Increased use of the rail corridors for mass transportation also will offer advantages in reduced

highway congestion and engine emissions , reduced land use requirements for highway and parking improvements and reduced home and business relocation resulting from such improvements . There appears little doubt the capital cost of increasing the capacity of the underused rail corridors is considerably less than the cost of increasing the capacity of the overtaxed highway system providing the commuter will choose public transportation over his other two principal alternatives , (1) his automobile and (2) not going to Boston .

The experience gained from the Mass Transportation Commission program, the MBTA South Shore Line, and programs in other cities for improved railroad commuter, rapid transit and bus service indicates ridership on mass transportation systems can be increased when the proper conditions exist and the right policies are adopted .

General Policy and System Considerations

The arguments for preserving and improving mass transportation in some form on the existing railroad commuter corridors both from the standpoint of return on the transportation dollar invested and improved living conditions are overwhelming . The subsidy provided by the Commonwealth from 1965-1967 and continued on a year-to-year basis until the present has provided the following:

1. Preserved Railroad commuter service between the communities on the rail corridors and Boston during a period when no other adequate transportation replacement system was available .

2. Preserved Railroad commuter service during a period of major transportation systems study and re-evaluation on a community, state, and federal level. Failure to preserve the service might have resulted in loss of corridor use for public transportation purposes as well as jeopardizing the option of rail transportation as an alternative in the total transportation picture.
3. Preserved railroad commuter service while federal legislation was being developed to make funds available to the states for improvements to mass transportation systems.
4. Preserved railroad commuter service while rapid transit extensions were commenced to Braintree, Oak Grove, and West Roxbury.

The Commonwealth's year-by-year subsidy has accomplished the goals outlined above at close to the minimum possible cost to the taxpayer.

Effective as the Commonwealth's subsidy program has been in preserving essential service in the rail corridors and buying time for the development and financing of an overall transportation plan, it has been by intent a short-term plan and has been complicated by the serious financial plight of the Railroads which has led to the bankruptcy of both the Boston and Maine and the Penn Central during this period. A steady deterioration of the fixed plant, equipment and employee morale of the Railroads has resulted in reduced operating speeds and quality of service. The limited equipment available and equipment condition has made it virtually impossible to improve service frequency as a means to increase ridership. Efficiency improvements which might have

assisted in holding down operating costs required capital investments by the State with a service life far beyond the term of the subsidy contract on property owned by the private carrier. Even maintenance expenditures such as limited cross tie and ballast renewals involve installation of material with thirty and forty year service life with State funds on private property under a one year subsidy contract.

The condition of railroad facilities limits continuation of passenger service beyond 1973 without initiating a carefully planned and scheduled program for upgrading plant and equipment over the next decade. Both Railroads have stated the need for a long-term program by the State and have threatened to refuse to assent to another one-year contract. While bargaining posture may be involved in the Railroads' position, the condition of railroad facilities and the real need to progress an improved transportation system rather than holding the line indicates the Commonwealth should adopt a long-term policy for the rail corridors, including the necessary legislative and executive action.

Future use of the rail corridors by the Commonwealth for mass transportation purposes would appear to require as first priority, acquisition of the rights-of-way or, at a minimum, a long-term easement or lease of facilities involved in the proposed use in order to progress any program of capital expenditures.

Alternative Mass Transportation Systems

The many systems now available or being planned for the mass movement

of people were considered for development in the existing rail commuter corridors. Preliminary analysis of the newer systems such as monorail, people movers, and linear induction motor propulsion devices indicated they were uneconomic due to the need for compatibility with railroad freight operations on the same rights-of-way in most corridors. The systems which appeared to be most feasible were:

1. A reorganized and up-graded consumer-oriented railroad commuter service.
2. Rapid transit extensions over railroad rights-of-way similar to the South Shore and Haymarket North projects.
3. Transit extensions over rail rights-of-way by means of the installation of an overhead catenary system with the minimum railroad facility changes necessary for operation of transit cars over railroad tracks. Joint railroad transit use of tracks would be permitted when necessary.
4. Various combinations of the above rail transportation systems.

In addition to the above, express bus-way use of railroad rights-of-way was considered. In general, such use appeared to have little value as railroad freight operations are still necessary in most of the corridors limiting express bus-way potential to the few branch lines on which freight service may be discontinued.

Improved Railroad Commuter System

A study was initiated at the request of Governor Sargent early in 1972 to develop a "Commuter Rail Improvement Program." A preliminary report

for discussion purposes was completed in November. The report recommends that the commuter rail network be made an integral part of the public transportation system of eastern Massachusetts managed by a "new incorporated subdivision or directorate of the MBTA." The report further recommends consideration be given to a program of plant and equipment upgrading to improve comfort, speed and reliability, additional equipment be acquired to increase the capacity and frequency of service, and a consumer-oriented marketing and sales program be instituted. The primary purpose of recommending the commuter rail system be managed by the MBTA is to integrate the railroad, transit, bus operations into one efficient and coordinated mass transportation system. An estimated 42% increase in ridership is forecast by 1980 in the CRIP report if the recommended program is progressed.

A commuter rail system as recommended by CRIP in its preliminary report offers several advantages:

1. Increased use and continuation of a presently operating system.
2. Initial investment can be relatively modest.
3. Capital investment program can be spread out over a relatively flexible time period to more easily fit the available financial resources.

While the capital investment in an upgraded railroad commuter system can be distributed over a considerable period of time, it does involve a major financial commitment by the Commonwealth over the next ten to twenty years. The most pressing requirements in the initial years will be upgrading

or replacing existing passenger equipment and purchasing additional equipment. No increase in ridership of any magnitude can be achieved without additional equipment, nor can reliable service be provided for long without upgrading or replacing the existing equipment. Conventional equipment such as is operated by the Penn Central has significantly higher operating costs than push-pull or self-propelled equipment due to slower turn-around time and the terminal facilities required for turning equipment and/or running around passenger cars. The conventional equipment should be phased out as soon as possible due to its poor condition and to achieve the operating economies of push-pull or self-propelled operation.

The deferred maintenance in track and right-of-way which has resulted in reduced line speeds, slower schedules and reduced service must be corrected by a major track material replacement program spread over the next ten years on those lines which will have commuter service.

Station and parking improvements are also necessary if ridership is to be increased. In addition, new stations should be constructed with major parking facilities at selected expressway locations.

Grade crossing elimination will become more important both for safety and elimination of crossing congestion as frequency of service is increased. A major grade crossing elimination program appears essential over a twenty-year period.

A capital program as outlined in the CRIP report does not appear feasible without acquisition of the rights-of-way to be used and without effective management control of the plant and train operation.

An approximate estimate of the Commonwealth's investment (including Federal Funds) over the next twenty years to achieve an improved railroad commuter system on a limited basis is:

Rights-of-way acquisition,* upgrading and purchase of equipment, and equipment servicing and repair facilities	\$125,000,000
Track, signal and rights-of-way upgrading and improvements. Station improvements and new express-way stations.	45,000,000
Grade Xing Eliminations	<u>80,000,000</u>
Total	\$250,000,000

*Including Reading Line and proposed \$19,500,000 Penn Central right-of-way purchase.

The above is the capital investment only and does not include any cost of the anticipated operating losses of the system. The capital investment necessary for a railroad commuter system over the long term with improved ridership is still considerably smaller than the investment in the highway-parking system which would be required to handle the number of people involved without increasing congestion on the existing roads. The costs of land use loss, environmental damages, and relocation of businesses and homes involved, as well as the operating costs of the highway-parking

system would appear to exceed the anticipated railroad commuter operating loss. As an alternative to handling the same people by private automobile, a CRIP-type program appears both economical and desirable.

The existing commuter railroad operation has a major disadvantage as a public transportation system for commuters in the location of its Boston station terminals. North Station is about a 15 to 20 minute walk from the heart of the central business district and an 8 to 10 minute walk from the Government Center State Street area. Past surveys of North Station commuters indicate over 40% regularly take public transportation to get from North Station to their Boston destination. The average transfer times from the train to the Orange Line or Green Line transit car is 8 to 9 minutes and an additional cost of \$.50/day over the commuter fare. It appears certain the time and cost penalty of the North Station location restricts the number of people presently using the system and the number that can be attracted to an upgraded system. The Boston and Maine North Station commuters represent close to 70% of the railroad commuters now entering Boston.

The railroad commuters entering Boston on the Shore Line and Boston & Albany corridors of the Penn Central have both Back Bay and South Station as Boston terminals. The superiority of the Penn Central terminals to the Boston and Maine's North Station is reflected in the number of commuters who take public transportation from South Station to their Boston destination: 15% vs. 40% at North Station.

Back Bay is very convenient to the Prudential-Copley Square complex but relatively inaccessible to the Central Business District, Government Center, etc. The transfer from Back Bay Station to the Green Line is poor even in comparison to the North Station transit transfer. South Station is the most accessible terminal to the Central Business District. The State Street Government Center area is a 10 to 12 minute walk from South Station and by MBTA requires a transit transfer from the Red Line to Orange Line at Washington Street.

While the Penn Central's Back Bay and South Station terminals for commuters are clearly better than the Boston and Maine's North Station, the time cost penalty of a terminal location south of the center of downtown Boston still restricts the number of people presently using the system and the number that can be attracted to an upgraded system. The Penn Central carries a little more than 30% of the railroad commuters to Boston at the present time.

The Boston Transportation Planning Review has recognized the commuter railroad terminal problem by suggesting a study to link North Station to South Station in connection with depressing the Central Artery and also adding an additional station stop in the State Street area. If the North Station-South Station connection is analyzed, the following criteria should be considered:

1. Drawbridge #1 carrying four Boston and Maine tracks into North Station should be eliminated by either a tunnel under the Charles River or a new high level fixed bridge.

2. The Boston and Maine is presently operating 120 trains in each direction per weekday. The trains enter Boston over four double-track corridors converging to four tracks over the Charles and on into the ten station tracks at North Station.

The Penn Central has 44 trains in each direction daily. The trains enter Boston over six tracks into the ten station tracks at South Station.

An upgraded rail system will require increased train frequency to increase patronage. The Boston and Maine in the Forties operated 325 trains per day. Forecasts for commuter and Amtrak service at South Station indicate 80 trains per day in each direction should be anticipated in the Eighties if high-speed service in the Northeast Corridor becomes a reality.

It is doubtful that the present peak-hour service with normal railroad equipment loading and unloading times could be operated on a two-track connector. A four-track connector appears necessary to provide adequate capacity for the future. A four-track right-of-way would be approximately 50' wide, not including structural supports. Space will also have to be provided for diverging and converging tracks into and out of North Station, State Street Station, and South Station.

3. Station platforms 1200' long will be necessary to handle Amtrak trains.

A connector adequate for present and future service requirements would appear to have a construction cost in the hundreds of millions of dollars. In addition, major disruption of surface streets and utilities will be necessary in the heart of Boston during the construction period. Right-of-way needs would appear to require land-taking and extensive demolition of buildings along the route.

The high cost and construction problems involved in building a connector compel careful analysis to insure the benefits are commensurate with the cost and that similar benefits cannot be achieved more economically by other means.

Grade Separated, Exclusive Use, Rapid Transit Extensions

Rapid transit extensions over railroad rights-of-way such as the recently completed South Shore Red Line to Quincy over the Old Colony right-of-way and similar extensions in other cities have demonstrated the public will patronize quality rail public transportation.

The South Shore line, the Haymarket North extension over the Reading line and the planned extension of the Orange Line to West Roxbury via the Shore Line and Needham Branch are based on similar design criteria including:

1. Exclusive track use for rapid transit with separate and grade separated railroad facilities when required.
2. Grade separated highway and river crossings.
3. Third rail power supply with fenced-off rights-of-way.

4. Advanced signal systems with automatic train control features.
5. All new stations including improved highway access, large-capacity parking facilities, and prepaid fare collection.

The design standards outlined above produce excellent rail transportation facilities comparable, in highway terms, to the interstate system. Since many transit extensions are competing with the interstate highway system or highways with very similar design standards, there is logic in constructing transit extensions with such design standards. The construction cost of the new transit extensions are presently ranging from \$6 million to \$30 million per mile. With rail transportation construction and equipment funds much less available than highway funds, the Commonwealth must evaluate the merits of building relatively few miles of South Shore, Haymarket North type construction vs. upgrading an entire commuter rail system with the same funds in a given period of time. Transit extensions over railroad lines eliminate the Boston Terminal Station problem of the Railroad by offering improved destination choices on the line and better and quicker transfer to other transit lines. Transit extensions also eliminate the problem of the existing railroad approach from the North via a single Drawbridge Crossing of the Charles by offering four double track, grade separated crossings of the Charles (and Boston Harbor) into Boston via the Red, Green, Orange, and Blue Lines.

Minimum Capital Cost Transit Extensions over Railroad Rights-of-Way

An alternative to either an upgraded railroad commuter system or South Shore style rapid transit extensions is a "minimum cost" transit extension

program which could combine many of the best points of the other two systems. Design criteria for the minimum cost transit extension system is proposed as follows:

1. A new overhead catenary system will be constructed to supply power to transit cars over railroad rights-of-way. Third rail transit cars will be equipped with pantographs for operation similar to the Blue Line transfer from third rail to pantograph at Maverick Station.
2. Existing railroad d-c signal systems and crossing protection will be converted to either a-c or audio frequency track circuits to be compatible with electrified operation.
3. Overhead clearances will be provided for Plate "C" railroad clearance and an overhead catenary system on lines with joint railroad local freight and transit use.
4. Connectors will be constructed to link transit lines to railroad lines.
5. Railroad local freight operation will be permitted when necessary on the transit extensions and will operate under the same general conditions as with the existing railroad commuter operation.
6. Transit cars will operate over the existing railroad tracks, bridges, and grade crossings on the transit extensions.
7. The only station facility changes will be construction of high level platforms (not required for Green Line Extensions) and an interlocked gauntlet track through stations where necessary to provide

sufficient side clearance by station platforms for railroad local freight operation.

8. Operating speed will be the same as for the existing railroad passenger trains until such time as track is upgraded for higher speeds where desirable.

Orange and Red Line transit extension equipment should be capable of 70 mph operating speeds. Blue Line and Green Line transit extension equipment should be capable of 60 mph operating speeds. Seating arrangements in transit extension equipment should be similar to the South Shore cars, i.e., a compromise between railroad and transit seating.

9. Overhead catenary construction, signal changes, transit railroad connector links and station gauntlet tracks should be constructed without serious interruption of railroad commuter service. Portable high level station platforms should be put in place on cut-over day from railroad to transit operation and permanent high level platforms constructed after transit operation is underway.

The "minimum cost" transit extension system provides the railroad commuter with the Boston destinations of the transit line to which they connect as well as improved transfers to the other MBTA lines. This provides superior destination choice in Boston and better transfer to the other MBTA lines than would be provided by the proposed railroad tunnel between North and South Stations.

The capital cost of the proposed minimum cost system is substantially

less than the cost of the South Shore type extension. The greater safety and reliability of the grade separated (from both highway and railroad freight operations) system of a South Shore Line is sacrificed in the minimum cost system and the right-of-way and operating standards of the existing railroad line substituted. The option to upgrade the right-of-way over the long term, as proposed for an upgraded commuter railroad, is also open to the minimum cost transit extension.

The capital cost required for the minimum cost overhead catenary transit extensions is greater than the upgraded railroad commuter system by approximately the cost of the catenary system, conversion of signal systems and cost of the connector links. The capital cost of the North Station to South Station railroad connector as recommended for study by the BTPR and which appears necessary to achieve proper destination choice in Boston for a commuter railroad system, appears considerably higher than the cost to connect to and convert railroad lines for the proposed minimum cost overhead catenary transit extensions.

The minimum cost overhead catenary transit extension appears feasible on all railroad commuter lines except the Boston & Albany. Physically, a connection can be made with relative ease to the Orange Line - Shore Line connector east of Back Bay. However, the Boston & Albany corridor is the single most important line for through-freight operation into the Core Area (see "Future Study Area Railroad Freight System Requirements", pages 38 - 47 and "Recommended Railroad Freight System", pages 108 - 110). Through-freight operation requires maximum overhead clearance which drastically increases the cost of installing an overhead catenary system in

this corridor as compared to the other five existing railroad commuter corridors. The Boston & Albany corridor is also handling the smallest number of commuters and appears to have the best alternative transportation choices, i.e., the Massachusetts Turnpike, bus service via the Massachusetts Turnpike and the MBTA Riverside Line. In addition, as on the Shore Line, railroad passenger operation on this line appears to be long term due to Amtrak's intercity service to Boston.

It is recommended that upgraded Budd car equipment be used in an MBTA managed rail suburban service on the Boston & Albany line and that such service be coordinated with bus and transit operations and marketed as an integral part of the proposed suburban overhead catenary transit extension system.

The Budd car suburban service proposed for the Boston & Albany line will offer a new within station transfer to the Orange Line at Back Bay with time savings in transfer to the MBTA as compared to either Back Bay or South Station now. In addition, it is recommended consideration be given to including the Back Bay railroad-transit transfer in one fare for the Boston & Albany corridor service.

The operating cost of the minimum cost overhead catenary transit extension is significantly less than either the existing railroad commuter service or a South Shore style extension for the following reasons:

1. The manning rules of both the Penn Central and Boston and Maine result in from 1.3 men per car to 2.0 men per car depending on the length of train vs. one man per car on the MBTA with on-board

fare collection. The MBTA saving is reduced by the smaller capacity per car of transit equipment vs. railroad passenger equipment. Except for the Blue Line, new transit equipment can feasibly be within 15% to 25% of the seating capacity of railroad equipment. Based on operating the present train schedule with equivalent seating capacity per train (increased number of transit cars vs. railroad), transit operation is estimated to be \$1,100,000 less annually than the existing railroad cost.

The North Station railroad terminal, including Tower A and the Engine Terminal, and terminal expense would be eliminated by the overhead catenary transit extensions to all four railroad commuter corridors and the replacement of railroad equipment by transit equipment. The cost of the facilities now borne by the MBTA is \$1,200,000 annually. South Station Terminal expenses included in the MBTA subsidy contract are estimated to be \$600,000 annually. This expense can be eliminated entirely by overhead catenary extension of the Orange Line over the Shore Line corridor and if the proposed Boston & Albany Budd car service is turned at Back Bay with the new Orange Line within station transfer at Back Bay substituted for South Station.

Total annual operating savings of the proposed minimum transit extension system for service equivalent to the subsidized railroad suburban service is \$2,900,000 (50% of the 1971 commuter railroad subsidy borne by the State).

2. The minimum cost transit extension would have on-board fare collection and not manned stations with prepaid fares as on the South Shore Line or Haymarket North. The additional labor cost of manned stations would not be offset by train crew savings due to elimination of on-board fare collection with the present train schedules on the railroad lines. The estimated operating savings on on-board collection vs. prepaid fares for the station spacing and train schedules of the existing railroad commuter system is \$4,000/mile annually.

Acceleration and deceleration and loading and unloading characteristics of electrified transit equipment are generally superior to diesel powered railroad equipment and air pollution is reduced. Less transit equipment appears necessary than railroad equipment for equivalent service due to the ability to run transit equipment through (Needham to Reading, for example) with fewer turnbacks and partial use of transit extension equipment for subway equipment in the existing transit system.

The time necessary for the construction of the minimum cost overhead catenary transit extensions for a major portion of the present railroad commuter system is estimated to be in the vicinity of seven to twelve years. During this interim period, commuter rail service should be continued and a plant upgrading program progressed to maintain satisfactory railroad commuter service. Upgrading of the fixed plant should be compatible with

the transit extension system. Upgrading or purchase of railroad equipment should be limited to that necessary for operation of the interim commuter service.

RECOMMENDED MASS TRANSPORTATION PLAN

A "minimum-cost" transit extension program is recommended for the Boston-Suburban area. The recommended system appears to best meet the two most significant problems faced in the development of an improved rail transportation system:

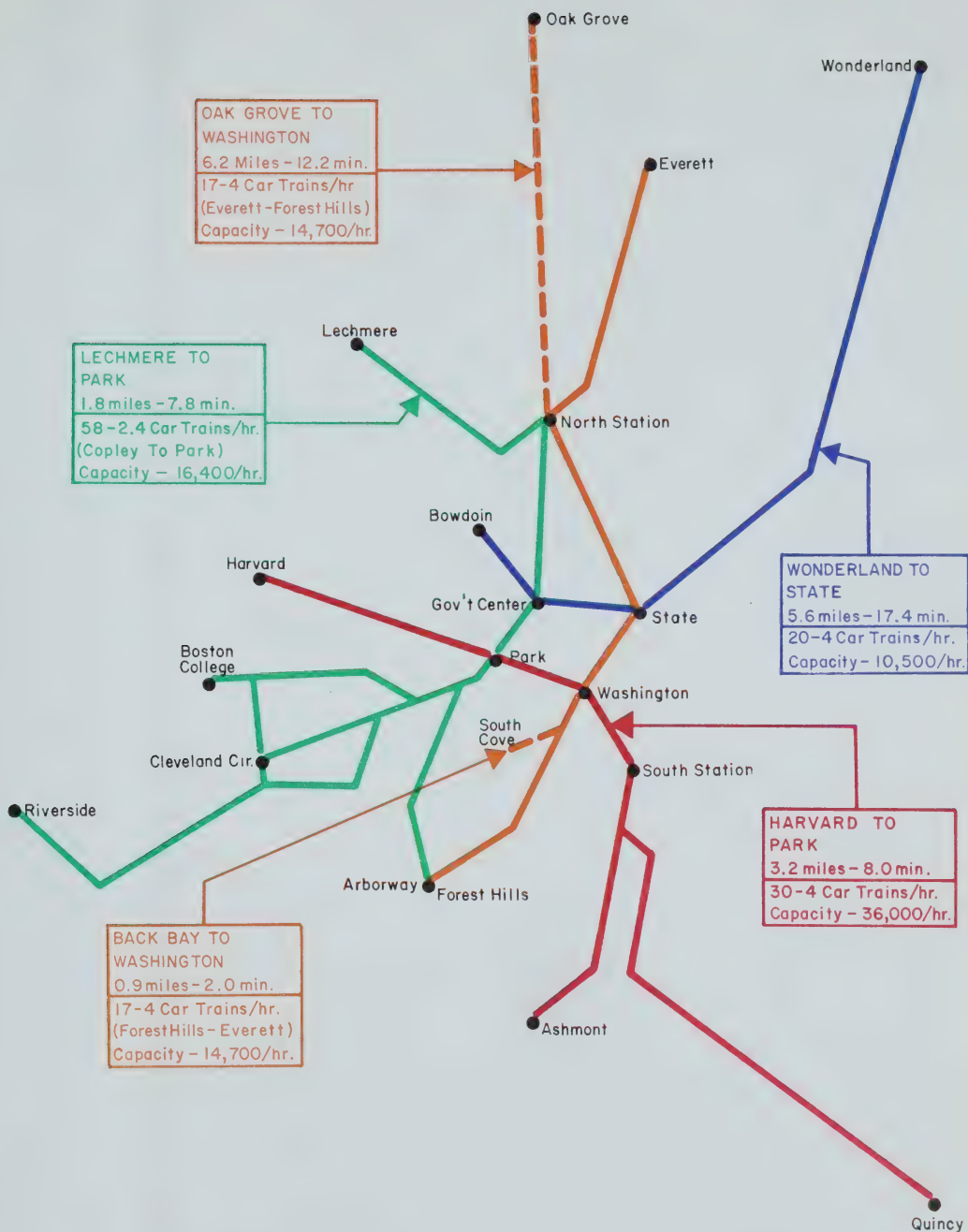
1. Good Boston destination choice.
2. Relatively modest initial investment and flexibility of capital investment with time to meet available financial resources.

Capacity Analysis of Proposed Suburban Transit System

A preliminary analysis was made of the capacity of the proposed system to handle the existing railroad passengers and the capacity potential for future growth. On page 79 a schematic map of the MBTA system shows the existing inbound peak hour service operated and the mileage and time from the proposed railroad-transit connector location to the most centrally located station on each transit line. The capacity of the cars per inbound peak hour now being operated on each line is also shown.

On page 80, a schematic map of the existing railroad commuter service shows the trains and passengers at the inbound peak hour now operated and present schedule times and mileage from selected suburban stations to North or South Station.

On page 81, the minimum cost overhead catenary transit extension system is shown schematically replacing the existing railroad commuter system. Also shown are the existing and maximum passenger capacity of the



**EXISTING MBTA
 INBOUND PEAK HOUR
 SERVICE
 August 1972**

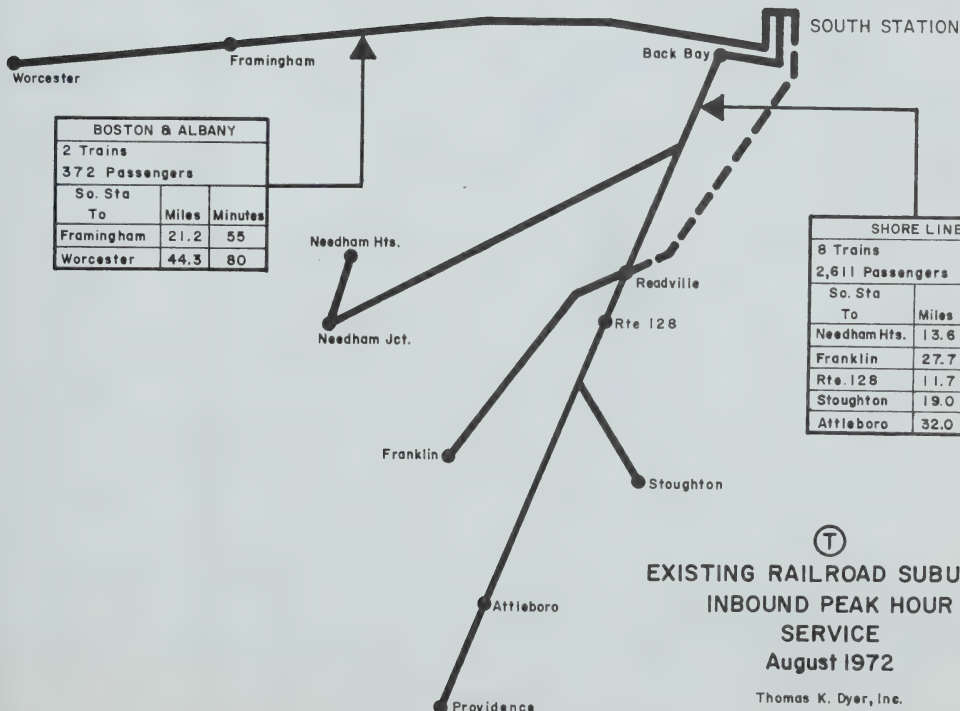
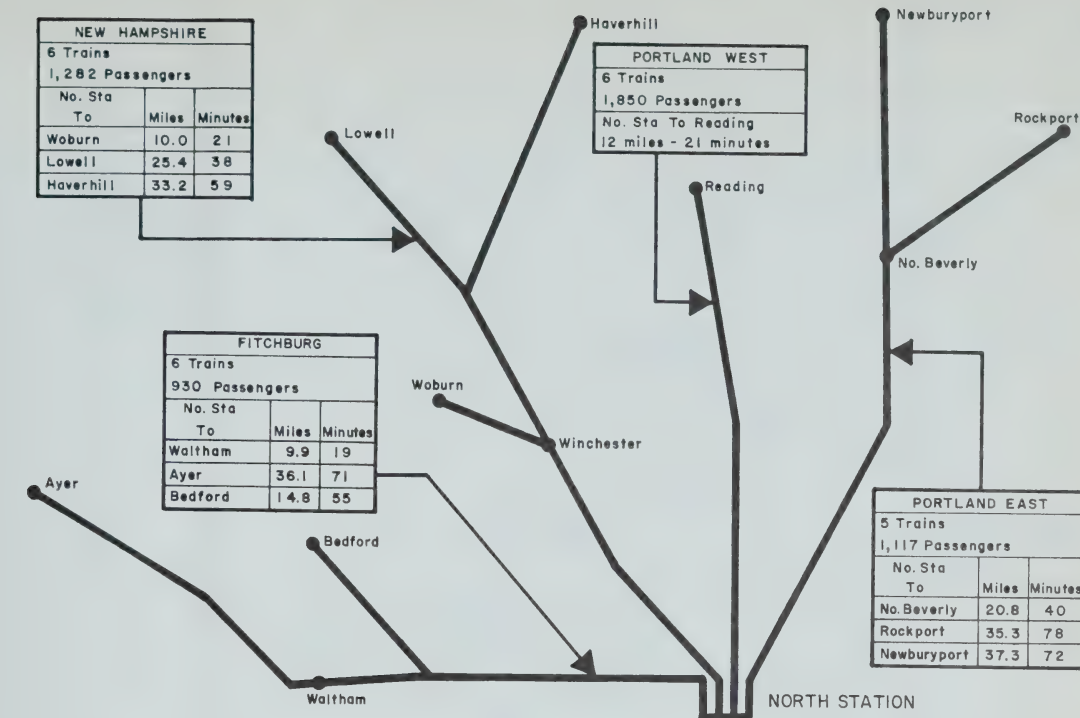
Thomas K. Dyer, Inc.

NEW HAMPSHIRE			
6 Trains			
1,282 Passengers			
No. Sta	To	Miles	Minutes
Woburn		10.0	21
Lowell		25.4	38
Haverhill		33.2	59

PORTLAND WEST			
6 Trains			
1,850 Passengers			
No. Sta	To	Miles	Minutes
Reading		12 miles - 21 minutes	

FITCHBURG			
6 Trains			
930 Passengers			
No. Sta	To	Miles	Minutes
Waltham		9.9	19
Ayer		36.1	71
Bedford		14.8	55

PORTLAND EAST			
5 Trains			
1,117 Passengers			
No. Sta	To	Miles	Minutes
No. Beverly		20.8	40
Rockport		35.3	78
Newburyport		37.3	72



BOSTON & ALBANY			
2 Trains			
372 Passengers			
No. Sta	To	Miles	Minutes
Framingham		21.2	55
Worcester		44.3	80

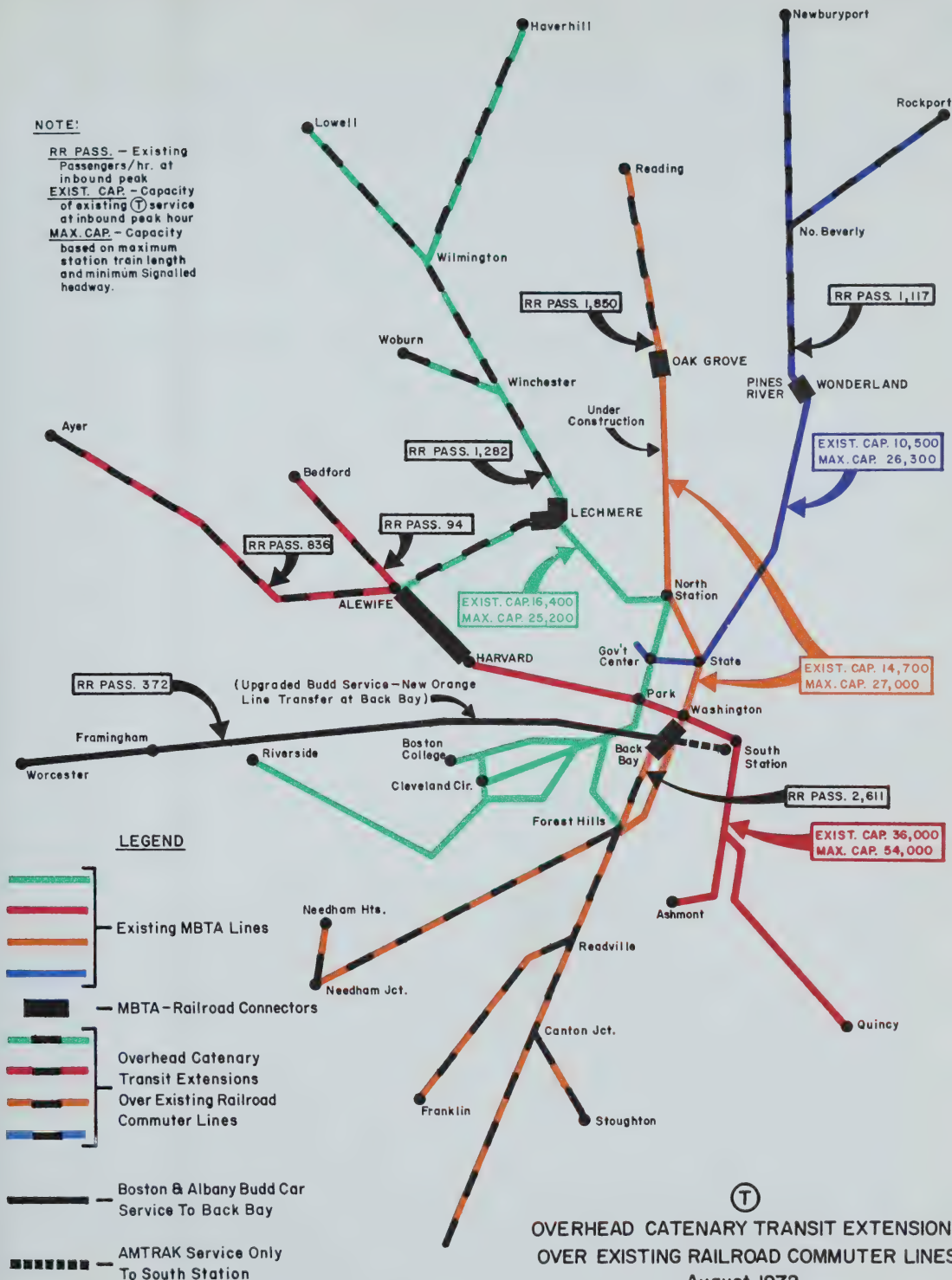
SHORE LINE			
8 Trains			
2,611 Passengers			
No. Sta	To	Miles	Minutes
Needham Hts.		13.6	37
Franklin		27.7	62
Rte. 128		11.7	23
Stoughton		19.0	35
Attleboro		32.0	53


**EXISTING RAILROAD SUBURBAN
INBOUND PEAK HOUR
SERVICE**
August 1972

Thomas K. Dyer, Inc.

NOTE:

RR PASS. - Existing
Passengers/hr. at
inbound peak
EXIST. CAP. - Capacity
of existing $\textcircled{T}$ service
at inbound peak hour
MAX. CAP. - Capacity
based on maximum
station train length
and minimum Signalled
headway.



**OVERHEAD CATENARY TRANSIT EXTENSIONS
OVER EXISTING RAILROAD COMMUTER LINES
August 1972**

Thomas K. Dyer, Inc.

of the present transit system and the existing railroad passengers to be carried on the overhead catenary extensions. All passenger figures are for the inbound peak hour.

The existing capacity of the transit cars now operated is shown and the maximum capacity for each transit line. Maximum capacity is based on: the train length established by the minimum platform length of the transit stations planned in the present MBTA station improvement program; and headways no less than presently provided by the transit signal system.

The capacity capability of the proposed suburban transit system illustrated by the three schematic maps of peak hour service and capacity can be summarized as shown in the following table

Inbound Peak Hour

Corridor	Existing MBTA Service Capacity	Maximum MBTA Capacity	MBTA Reserve Capacity	Present Railroad Commuter Passengers	% Railroad Passengers to MBTA Reserve Capacity
Portland East - Blue Line	10,500	26,300	15,800	1,117	7.1
Portland West - Orange Line ¹	14,700	27,000	12,300	1,850	15.0
New Hampshire Green Line	16,400	25,200	8,800	1,282	14.6
Fitchburg - Red Line	36,000	54,000	18,000	930	5.2
Shore Line - Orange Line ²	14,700	27,000	12,300	2,611	21.2
TOTALS	92,300	159,500	67,200	7,790	11.6

¹ Southbound

² Northbound

Trip Time Analysis of the Proposed Suburban Transit System

A trip time comparison of the existing commuter service and the proposed suburban transit system was made and the results are tabulated on pages 85, 88, and 90. The basis of the comparison for Boston and Maine Corridors (Table, page 85) was as follows:

1. The existing railroad schedule was used from selected locations on each line to North Station to determine trip time.
2. The transfer time from train to the Orange Line or Green Line was determined by field time tests during peak hours and also the transit time to Park Street on the Green Line and to State Street and Washington Street on the Orange Line.
3. Total railroad-transfer-transit time from selected stations on the railroad lines to centrally located transit stations is the sum of items 1 and 2 above.
4. The proposed suburban transit system time was computed by assuming running time for transit and railroad were identical on the railroad right-of-way. Station stop times were estimated to be 80 seconds less for transit equipment due to superior acceleration, deceleration, and loading and unloading characteristics. Actual field time tests were used in part to determine station stop time savings.

Trip time from the connector link to the most centrally located stop on the transit lines was arrived at from field time tests where

possible and computed for new segments such as Oak Grove to Haymarket. The transit stations used for each line were: Blue Line - State Street; Orange Line - Washington Street; and Green Line - Park Street.

The trip time comparison indicates an average time saving of 11 to 12 minutes from the selected station on the Boston and Maine Railroad line to the transit station used in the Table via the proposed suburban transit system vs. the existing railroad-transfer-transit time. The time saving via the suburban transit system is close to 30% of the present trip time for the destinations used.

Except for those working in the immediate vicinity of North Station, present railroad commuters to North Station should save a minimum of 10 to 15 minutes via the proposed suburban transit system since: (1) the trip time on the railroad line is reduced by the improved station stop time; (2) those now using the MBTA (40%+) save an 8 to 9 minute railroad-transit-transfer time; and (3) for those who walk, the Government Center - State Street area (an 8 to 10 minute walk) is the closest area drawing a substantial number of commuters.

SAMPLE TRIP TIME COMPARISON

EXISTING COMMUTER CORRIDORS VS PROPOSED SUBURBAN TRANSIT SYSTEM

LINE	EXISTING RAILROAD SERVICE SCHEDULE (Minutes)	EXISTING RAILROAD AND TRANSIT RIDE TIME (Minutes)	TOTAL RAILROAD, TRANSFER, TRANSIT TIME (Minutes)	PROPOSED SUBURBAN TRANSIT SYSTEM SCHEDULE (Minutes)	INCREASE(+) OR DECREASE(-) TRIP TIME
<u>PORTLAND EAST</u> B & M	No. Beverly To No. Station 40.0	No. Station To State St. Via Orange Line 11.0	No. Beverly To State St. 51.0	No. Beverly To State St. 40.7	- 10.3
<u>PORTLAND WEST</u> B & M	Reading To No. Station 21.0	No. Station To Wash.St. Via Orange Line 12.0	Reading To Wash.St. 33.0	Reading To Wash. St. 22.1	- 10.9
<u>NEW HAMPSHIRE</u> B & M	Wilmington To No. Station 23.0	No. Station To Park St. Via Green Line 14.0	Wilmington To Park St. 37.0	Wilmington To Park St. 27.4	- 9.6
<u>FITCHBURG</u> B & M	Concord To No. Station 38.0	No. Station To Park St. Via Green Line 14.0	Concord To Park St. 52.0	Concord To Park St. 37.4	-14.6

Trip time comparisons for the Penn Central's Shore Line Corridor commuter service (Table, page 88) were made as follows:

1. The existing railroad schedule from selected stations in the corridor to both Back Bay and South Station was used to determine trip time.
2. The proposed suburban transit system time on the railroad right-of-way was computed using either the existing railroad running time or the running time based on maximum transit equipment operating speed, whichever was greater. Station stop times were estimated as 80 seconds less per stop due to superior characteristics of transit equipment in this respect.

Trip time from the connector link east of Back Bay to Washington Street and State Street on the Orange Line was computed based on field time tests on the existing Orange Line.

The trip time comparison indicates a time saving to Back Bay from the selected stations on the Shore Line Corridor of 0 minutes to 13 minutes via the proposed suburban overhead catenary transit system vs. the existing railroad commuter service. The time saving is dependent on the location of the selected station and the number of station stops between the selected station and Back Bay. The existing railroad station stops only were used in the overhead catenary transit extension system outside the connector.

Since the Orange Line does not stop at South Station, a comparison to

South Station on the proposed suburban transit system would require a transfer from the Orange Line to Red Line at Washington Street. Likewise, comparing the railroad to Orange Line destinations requires a railroad-transit-transfer at South Station for Washington Street and to State Street, a railroad to Red Line transfer and then a Red Line to Orange Line transfer at Washington Street.

South Station on the Railroad and Washington Street or State Street on the Orange Line are not easily comparable as all three attract sizeable numbers of commuters. The choice of a one-ride trip on the proposed suburban transit system with Boston choices of Back Bay, Medical Center Washington Street, State Street, and Haymarket appear superior to the railroad commuter one-trip choice of Back Bay and South Station. The transfer to other MBTA lines is also better on the proposed suburban transit system as compared to the railroad transfer to transit at either Back Bay or South Station. The trip time comparison indicates time savings of the proposed suburban transit system to Washington Street of 2 to 15 minutes and to State Street, 0 to 13 minutes vs. commuter railroad time to South Station.

SAMPLE TRIP TIME COMPARISON

EXISTING COMMUTER SYSTEM VS PROPOSED SUBURBAN TRANSIT SYSTEM

PENN CENTRAL	EXISTING RAILROAD SCHEDULE (Minutes)	PROPOSED SUBURBAN TRANSIT SYSTEM (Minutes)
SHORE LINE CORRIDOR	Rte. 128 To Back Bay 18.0 So. Station 23.0	Rte. 128 To Back Bay 18.3 Wash. St. 21.0 State St. 23.2
(Shore Line)		
(Franklin Branch)	Franklin To Back Bay 57.0 So. Station 62.0	Franklin To Back Bay 44.0 Wash. St. 46.7 State St. 48.9
(Needham Branch)	Needham Hts. To Back Bay 32.0 So. Station 37.0	Needham Hts. To Back Bay 22.7 Wash. St. 25.4 State St. 27.6

Trip time comparisons for the Penn Central's Boston & Albany Corridor commuter service (table, page 90) were made as follows:

1. The existing railroad schedule from Framingham to Back Bay and South Station was used to determine present trip time.
2. The existing railroad- transit transfer time from South Station to Washington Street was based on field time tests at peak hour via the Red Line.
3. The proposed railroad - transit transfer at Back Bay via the new Orange Line to Washington Street and State Street was estimated based on field time tests of comparable situations where possible.

The trip time comparison indicates the new Orange Line transfer at Back Bay saves over 10 minutes to Washington Street as compared to the present Red Line transfer at South Station. In addition, Framingham to Washington Street via Back Bay and the new Orange Line transfer is one minute less than the present railroad time to South Station. To State Street via Back Bay and the new Orange Line transfer is a minute to a minute and a half more than the present railroad time to South Station.

SAMPLE TRIP TIME COMPARISON

EXISTING COMMUTER SYSTEM VS PROPOSED SUBURBAN TRANSIT SYSTEM

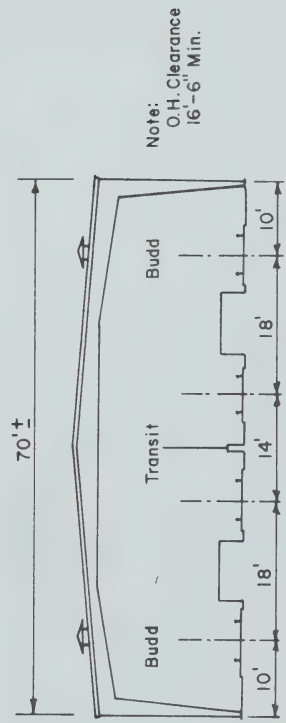
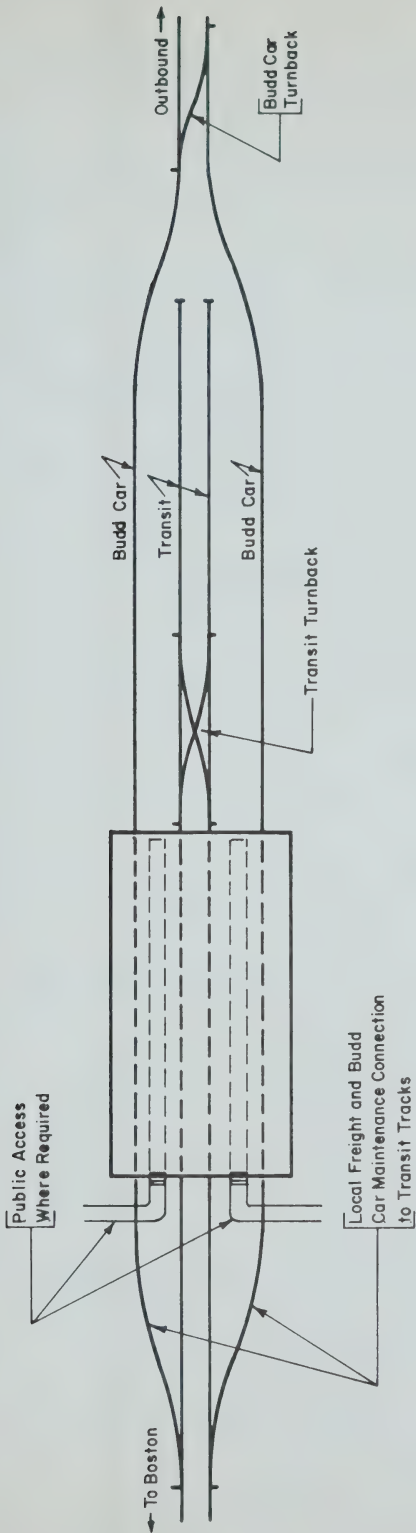
PENN CENTRAL	EXISTING RAILROAD SCHEDULE (Minutes)	EXISTING RAILROAD AND TRANSIT RIDE TIME (Minutes)	PROPOSED RAILROAD, TRANSFER, TRANSIT (Minutes)	EXISTING TOTAL RAILROAD, TRANSFER, TRANSIT TIME (Minutes)	PROPOSED TOTAL RAILROAD, TRANSFER, TRANSIT TIME (Minutes)
BOSTON & ALBANY	Framingham To Back Bay 50.0 So. Station 55.0	Transfer to Red Line at So. Station South Station To Wash. St. 9.6	Transfer to Orange Line at Back Bay Back Bay To Wash. St. 4.0 State St. 6.2	Framingham To Wash. St. (via So. Station) 64.6	Framingham To Wash. St. (via Back Bay) 54.0 State St. 56.2

Future Rail Transportation Service Alternatives

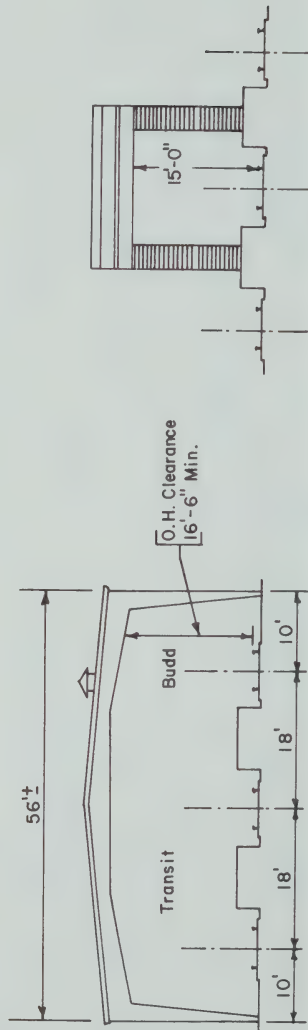
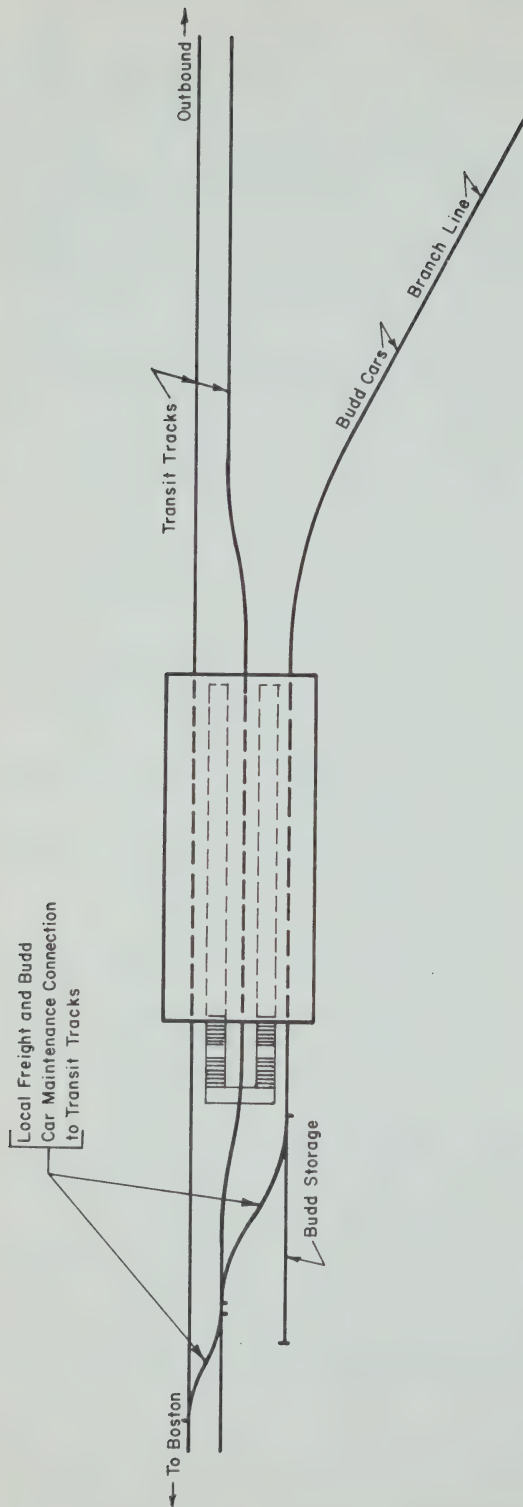
The past history, as well as existing patronage, of the railroad commuter system indicates public transportation should continue to be provided along the six rail corridors. The analysis of alternative systems has resulted in the recommended "minimum cost" transit extensions in the four Boston and Maine corridors and the Shore Line corridor with upgraded Budd car service on the Boston & Albany corridor and a new, within-station Orange Line transfer at Back Bay. The proposed system offers the opportunity of increased ridership over a railroad commuter system because of trip time savings, a generally improved one-ride Boston destination choice, and improved transfers to other MBTA lines.

By operating in all six corridors, the potential of continuing all the existing commuter service is retained as well as operating commuter service on branch lines which offered passenger service in the past.

Operating and construction program flexibility can be achieved during a phased overhead catenary transit extension program by means of Budd car shuttle service to Budd - transit across platform interchanges at the end of first-stage overhead catenary extensions. Budd - transit interchanges could also be used to either establish experimental passenger programs with Budd cars on lightly patronized existing lines or lines to be acquired on which there is presently no service. Sketches of Budd - transit interchanges typifying the facility requirements for an in-line shuttle and a shuttle for a branch line entering a transit extension corridor are shown on pages 92 and 93.



(T)
 IN LINE
 BUDD - TRANSIT INTERCHANGE
 August 1972
 Thomas K. Dyer, Inc.



(T)
 BRANCH LINE
 BUDD - TRANSIT INTERCHANGE
 August 1972
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Lines on which no rail passenger service is now operated and where passenger service potential may exist are shown on the schematic map of the Study Area rail system on page 97 and are listed by corridors below:

Old Colony Corridor The proposed acquisition of Penn Central's rights-of-way now awaiting approval included from Braintree to Brockton and Braintree to Plymouth. Both these lines had passenger service in past years. Passenger service can be provided with an overhead catenary extension from South Braintree for operation of South Shore transit cars.

Shore Line Corridor Also included in the purchase of Penn Central's rights-of-way were the lines from Stoughton to Whittenton Junction, Readville to Dedham, and Needham Junction to Millis on which no passenger service is presently operated. Passenger service can be revived on each of those lines by Budd car shuttle to Budd - transit interchanges at Canton Junction for the Stoughton Branch and at Readville for the Franklin and Dedham Branches connecting to the Orange Line extension over the Shore Line and to the Highland Branch of the Green Line at Cook Street for the Millis to Newton Upper Falls portion of the Needham Branch. In the long term, overhead catenary transit extensions of the Orange Line can be provided except possibly for the Millis connection which might be served by a Green Line extension.

The Dorchester Branch passes through a heavily populated area of

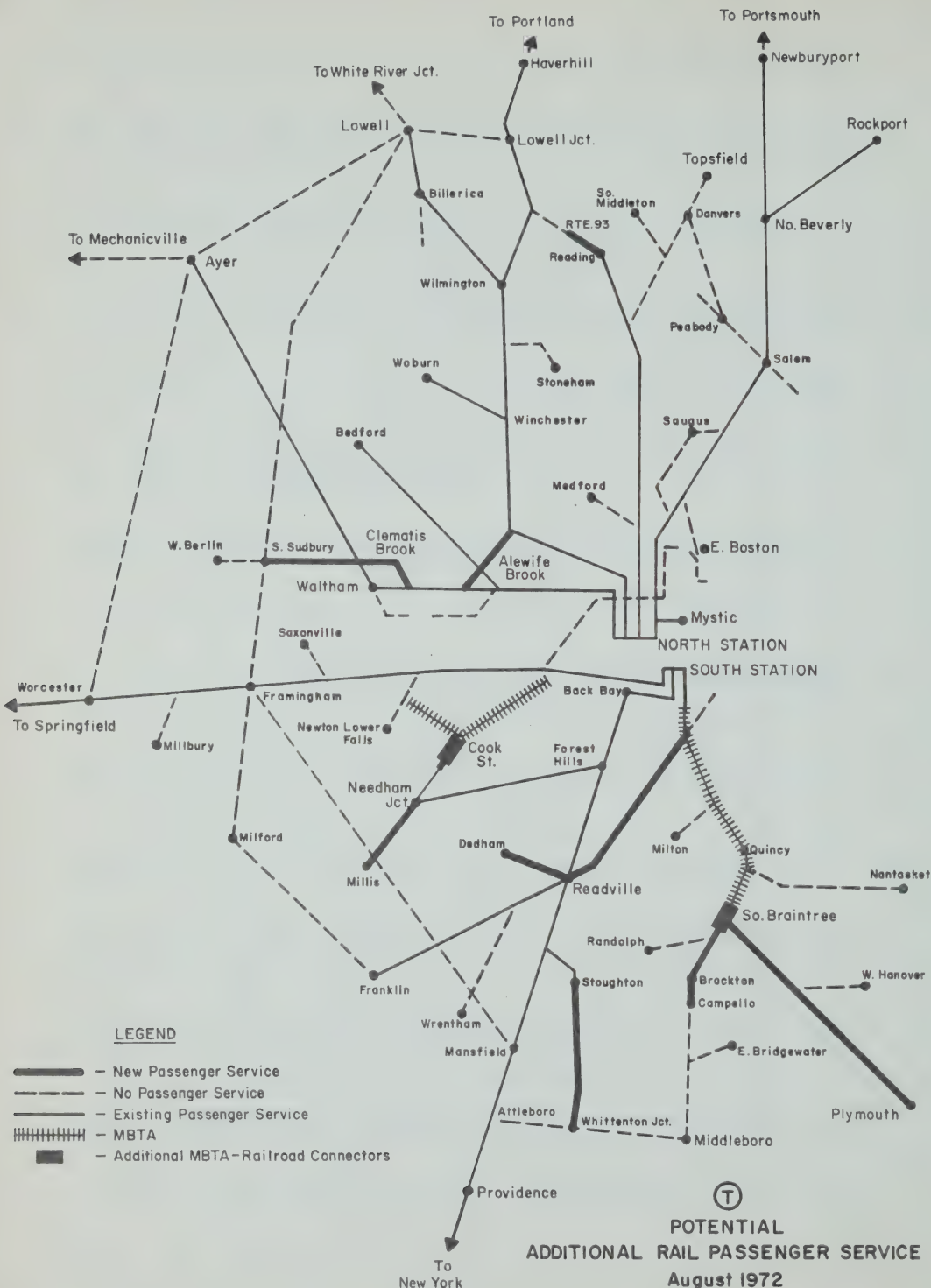
Boston between the Orange Line and Red Line of the MBTA. A connection can be made of the Dorchester Branch to the Red Line near Dover Street Yard or possibly to the Orange Line between Back Bay and South Station. In addition, the Dorchester Branch can be used for detour passenger service, if necessary, during construction of rail and/or highway facilities between Readville and Back Bay in the Shore Line Corridor. The Dorchester Branch also can be considered for the intercity rail corridor if the Shore Line Corridor width is inadequate for all the rail - highway uses planned.

Fitchburg Corridor The Bedford Branch of the Boston and Maine as well as portions of the Fitchburg Main Line have a pronounced Harvard Square to Kendall Square orientation based on past trip destination surveys and accounts in part for the low passenger volume in this corridor as North Station to Harvard Square - Kendall Square requires train to Orange Line (or Green Line) and Orange to Red Line transfers. Connecting this corridor to the Green Line eliminates one transfer, but still is inconvenient to Harvard Square. A more satisfactory connection of the Fitchburg-Bedford lines to the transit appears to be via the Red Line at Alewife Brook with overhead catenary extensions out from Alewife Brook. An extension of the Red Line from Harvard Square to Alewife Brook is already part of the MBTA master plan.

The Central Mass. passenger service was discontinued in 1971. An improved service, however, has the potential to attract additional riders. Improved service with greater frequency can be provided by a Budd shuttle to an across-the-platform type transfer at Clematis Brook to the overhead catenary Red Line extension; or, if future passenger volumes warranted, by an overhead catenary extension for operation of Red Line transit cars.

An additional service potential of the Lechmere connection of the Green Line to the Fitchburg Main Line is the opportunity to serve Somerville with transit service in the heavily populated Union Square to Porter Square area.

New Hampshire Corridor Additional Green Line transit service can be furnished to Somerville and Cambridge by providing an overhead catenary transit extension out the Freight Cut-off from Somerville Junction to the vicinity of Alewife Brook providing service to Davis Square, West Somerville, and North Cambridge. Restoration of Somerville and Medford stops along the New Hampshire Main Line, (Winter Hill, North Somerville, Tufts College, and Medford Hillside) with a possible turnback facility at West Medford will provide one-ride transit service to the Green Line Boston stations. The proposed suburban transit system makes it possible to serve Somerville with three lines - the Fitchburg, Fitchburg Freight Cut-off, and New Hampshire Main.



Suburban Transit System Station Policy

One difficulty in the development of increased patronage on a suburban rail system is the general inadequacy of the existing railroad stations.

A review of station conditions and patronage indicates the following:

1. Increased station parking area and improved access to parking facilities are required at many stations particularly the better patronized stations. The high percentage of walk-on passengers (50%) is partly due to inadequate parking facilities.
2. The majority of stations were constructed before the advent of the automobile at population centers for walk-on patrons. Because of this, many of the stations are poorly located to attract kiss-and-ride or park-and-ride patrons.
3. On the Boston and Maine, only the Lowell, Woburn, and Swampscott stations are owned by the Railroad. The remaining stations were conveyed to private owners with provision for minimum passenger facilities only.
4. The appearance and condition of the majority of stations is poor.

The commuter railroad lines pass through and serve both low density suburban towns and heavily populated cities. The objective of a suburban transit system should be to offer its services to as many people in the area as possible. The present patronage is predominantly walk-on. An up-graded system should broaden its patronage to attract more kiss-and-ride and park-and-ride passengers. Readily accessible stations to drivers are

necessary with good access and adequate parking facilities. In addition, bus service to suburban stations should be offered to increase the range for the walk-on passenger and, in some cases, to serve present walk-on passengers to a relocated station.

Each station stop in the existing rail commuter service costs two to two-and-one-half minutes time. At present, on some of the longer commuter runs, station stops amount to 20 minutes (up to 40% of the trip time.) Transit cars in the proposed suburban system will reduce the station stop time by over one minute per stop. The time penalty of poorly patronized stations should be avoided by eliminating such stops.

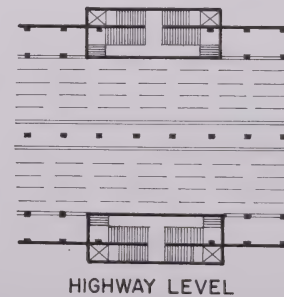
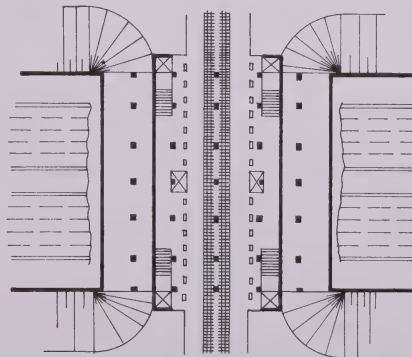
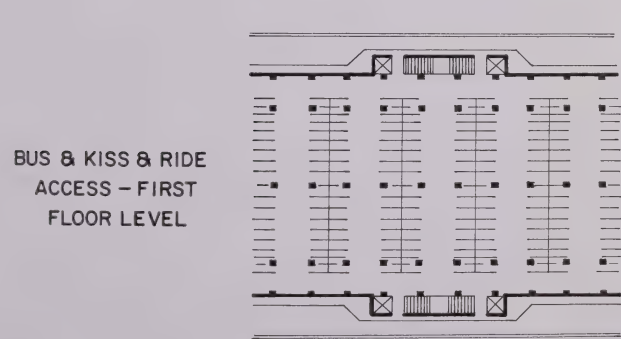
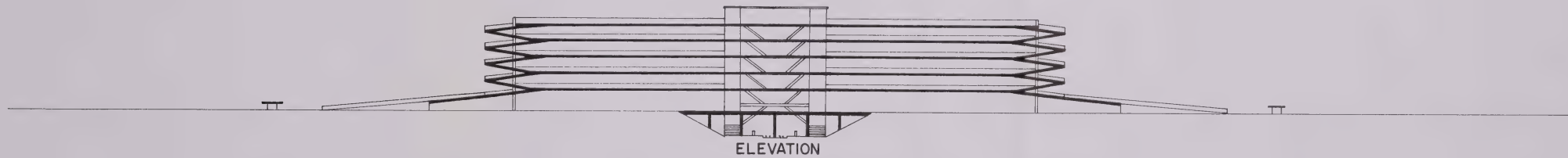
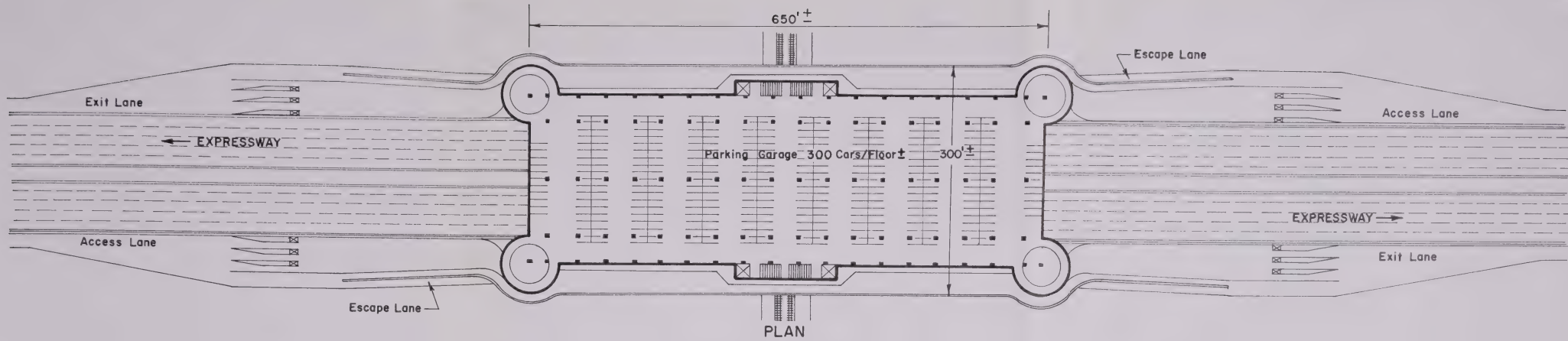
As pointed out above, increased parking area and readily accessible stations for the driver are needed to increase system ridership. In many cases, increasing the parking capability of stations will be difficult as the stations are located in the center of towns or cities. Increased parking facilities will also mean added traffic to station locations. Stations located at the intersection of major expressways and the railroad line quite often will offer the best access to the most commuters. At some of the expressway locations, 1,000- to 1,500-car parking areas may be necessary. Two obstacles to the construction of expressway stations are: (1) land is not available at many expressway railroad locations, and (2) access to expressway railroad locations is over local streets at many locations.

One possibility which might be considered at locations which are very

desirable, but have major land acquisition and access problems, is a parking garage constructed over the expressway-railroad intersection with access and egress directly from the expressway. The air rights parking garage is shown schematically on page 101. Access lanes alongside the expressway would be a mile to a mile-and-a-half long depending on the capacity of the garage to prevent back-up onto the expressway. Egress lanes would be approximately 1,500 feet long. In many of the more desirable locations, access and egress lanes will require retaining walls and bridge structures to grade-separate them from existing expressway ramps. Convenient kiss-and-ride and bus access should be provided. The approximate cost of typical expressway-railroad air rights parking garages and stations are:

	Parking Capacity		
	900 Cars	1200 Cars	1500 Cars
Access Roads	\$ 1,000,000	\$ 1,100,000	\$ 1,200,000
Station	700,000	700,000	700,000
Garage	<u>12,200,000</u>	<u>14,900,000</u>	<u>17,600,000</u>
	\$13,900,000	\$16,700,000	\$19,500,000

Expressway-suburban transit system station locations should include consideration of the intersection of railroad rights-of-way and Route 128, Route 93, and Route 495. Preliminary recommendations for expressway station



Ⓙ
PARKING GARAGE
OVER
EXPRESSWAY - TRANSIT
INTERSECTION

August 1972

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locations in the long term are:

<u>Railroad Line</u>	<u>Expressway</u>	<u>Location</u>
Portland East	128	Beverly
Portland West	93	Wilmington
New Hampshire	128	Woburn
New Hampshire	495	Lowell
Bedford	128	Lexington
Fitchburg	495	Littleton
Boston & Albany	495	Westboro
Needham	128	Needham

Suburban Transit System Fare Policy

The present ridership on the railroad commuter system does not justify manned stations with automatic fare collection facilities. On-board fare collection is recommended including exact fare provisions. As patronage and service frequency increases, automatic fare collection facilities can be installed at stations to cut both station dwell time and trip time by speeding up the passenger boarding process.

Trains will require a man per car until automatic fare collection facilities are provided at all stations. At that time, manning of trains can be reduced to a motorman for each train and a guard for every two cars.

The fare to be charged on the proposed suburban transit system is dependent upon the philosophy of government towards public transportation. The extremes of public policy are considering public transportation: (1) a service similar to police protection furnished by the government and supported

by the general fund, and (2) a service to be supported by the user.

Since the proposed suburban transit system can run for substantially less cost than the present railroad service, the opportunity exists to either reduce fares without increasing the deficit, or maintain existing revenues and reduce the operating deficit. A commitment to public transportation is in part based on the economics of public transportation as compared to furnishing additional highway-parking systems. It would, therefore, appear logical to support a rail transportation system in part from the gasoline tax or the general fund, both of which would be used to provide additional highway transportation and parking facilities to replace public transportation. At the same time, since the public transportation is more available and beneficial to some than others, there is justification in having a reasonable fare constitute the user's greater share of the cost than the non-user.

For a rail suburban transportation system to accomplish its objective of reducing the need for highway-parking systems in urban areas, it appears the State and Federal governments will have to bear a substantial part of the capital and operating costs. It is recommended user charges pay the major portion of above-rail costs (train crews, station personnel, and equipment costs).

Establishing a fare basis for the proposed suburban transit system is complicated by the inequities of present rail transportation charges such as: fare by MBTA from Route 128 via the Highland Branch to Boston is \$.50, whereas by railroad from Route 128 to Boston, it is \$1.20 to \$1.30. A fare structure is recommended which establishes zones equidistant from Boston

to recognize fares should reflect the distance travelled and that those travelling the same distance pay approximately the same fare. The simplification of any fare system to make it operationally feasible will introduce some unavoidable inequities. Establishing mileage zones as the primary basis of equal fares means charging the same for lines with unequal operating costs. Within the limitations of the compromises necessary to establish a workable fare system, the concepts of equal fares for equal distance travelled, fares increasing with trip mileage, and fares which pay the major portion of above-rail costs are recommended.

Equipment Alternatives

Except for the Boston & Albany service, equipment for the proposed suburban transit system in the long term will be new transit cars equipped for overhead catenary operation. On the Boston & Albany, upgraded Budd cars are recommended.

During a phased transit extension construction program, advantage should be taken of the superior equipment of the Boston and Maine vs. the Penn Central. The simplest line to extend for overhead catenary operation is the Orange Line to Reading, as construction is now underway to Oak Grove and no additional construction is required to join to the railroad line at Oak Grove. Extension of Orange Line service to Reading would discontinue operation of 30 Budd trains carrying 3330 passengers each way per day. This Budd equipment could be used to replace a substantial amount of the

conventional equipment in the Penn Central commuter service and should produce operating cost savings as well as better service.

Another first stage alternative would be to complete the Orange Line extension over the Boston and Maine from Oak Grove to Reading and the extension over the Needham Branch from the South Cove connection to the Orange Line. This alternative also releases the 30 Boston and Maine Budd car trains carrying 3330 passengers per day each way to be used to replace the Penn Central suburban equipment (less the Needham Branch Service) consisting of 22 trains carrying 3600 people. This second alternative would appear to permit complete replacement of Penn Central conventional equipment with Budd cars with the minimum requirement for new transit equipment and expenditure of transit extension capital funds. Transit operating efficiency and equipment utilization is better under this second alternative also as Needham Branch equipment would be run through to Reading and back. If, during construction of highway facilities between Forest Hills and Back Bay, discontinuance of service between these points on the Shore Line is desirable, the Needham Branch can connect to the elevated at Forest Hills.

An engine replacement program for a portion of the Boston and Maine Budd car fleet should be considered based on the railroad equipment needed for the time involved to complete an overhead catenary transit extension system over both Railroads (except for the Boston & Albany Line) and the number of Budd cars needed for the proposed Boston & Albany service.

Power and Catenary System

A substantial capital cost is involved in the construction of an overhead catenary system, sub-stations and appurtenances for transit extensions. Preliminary estimates indicate the cost range for the catenary and power system is approximately \$400,000 per mile of double track. Over \$60,000,000 would be required to construct an overhead catenary and power system for the lines now carrying railroad passenger service.

The power companies in New England have purchased easements over many railroad rights-of-way in the past for power transmission lines. Construction of new power lines will become increasingly more difficult with the passage of time due to land taking problems in urban areas. Joint usage of railroad corridors for power transmission and rail transportation, both passenger and freight, is a feasible solution in many instances to corridor requirements.

In addition, when joint use can be made of a power transmission system and of sub-station output as is the case when rail transportation utilizes an overhead catenary system for train propulsion, the benefits to the power company are greatly increased and rail transportation is not the sole user of the system.

When use, in addition to train propulsion, is made of the transmission system and power output of sub-stations by the power company, it is logical for the power company to own the catenary and power facilities as part of its total plant as it would in other locations with more than one user. Preliminary investigation of the feasibility of ownership of the catenary systems and

power distribution systems by the power companies indicates it is practical and that the power companies would make the necessary capital expenditures for the catenary and power system.

The proposed suburban transit system would own and install the trolley wire only (estimated cost approximately \$75,000 per mile of track).

Control of Rail Operations on the Suburban Transit System

One of the problems with the existing railroad commuter service is that management and operating control of the system is in the hands of the railroad although the cost is substantially borne by the MBTA. With a short-term subsidy contract and railroad ownership of plant and equipment, railroad control of operations is reasonable.

However, when rights-of-way are acquired by the MBTA, it is recommended that management and operating control, including dispatching of all trains, maintenance of the plant, and operation of suburban service trains, should be by the MBTA if they are the principal user of the right-of-way acquired. Local freight service would be operated by railroad personnel under control of MBTA dispatchers in the same manner Penn Central train crews operate over Boston and Maine lines to East Boston.

RECOMMENDED RAILROAD FREIGHT SYSTEM

On page 111, the existing railroad freight system is shown with through-freight daily carloads (both inbound and outbound) on through-freight rights-of-way and also local freight daily carloads (both originating and terminating) for each line in the system. Originating and terminating daily carloads placed and picked up by yard switchers at major yards are also shown at the yard locations. The figures on the map are estimated average daily car loads based on 250 days per year for local-freight carloads and 300 days per year for through-freight carloads. The schematic map is intended to show the existing freight system carload dual direction flow.

On page 112, the recommended railroad freight system is shown. The principal change is in the number of rights-of-way used for through freight within the study area. The Boston & Albany corridor is proposed as the sole east-west line into the Core Area for through-freight service. As discussed previously in "Future Study Area Railroad Freight System Requirements" (pages 38 to 47), the capacity of one double track corridor is more than adequate for the combined service with a substantial margin for increased traffic in the future. The construction of the South Boston Connector at South Station is required to complete the railroad distribution system consisting of the Grand Junction Branch, the Boston & Albany from Beacon Park to South Station, and the South Boston Connector. Clearance improvements from Framingham to Beacon Park, Beacon Park to the Boston and Maine, and Beacon Park to South Boston are also required.

The purpose of the recommended freight system is to provide an efficient rail freight service with adequate capacity to meet the present and future needs of the Study Area and, at the same time, to make the maximum number of railroad rights-of-way available for the proposed suburban transit system. One limitation to the use of the railroad lines for overhead catenary extensions is the clearance needed for freight operations. The Penn Central presently provides a minimum of six inches between its trolley wire and the maximum height of equipment being operated. Six inches is required for attachment to an overhead structure with an additional three-inch allowance for sag. A minimum of fifteen inches is required between an overhead structure and the top of the maximum height equipment to be operated for the catenary system. This would require nine to twelve inches more than the existing minimum clearance on a line (railroads reserve a three- to six-inch margin between published clearance and striking clearance).

Plate "C" railroad clearance only requires fifteen feet six inches at 7'-0" wide and this clearance will clear 95% of all cars moved. (See Plate "C" diagram on page 110). Except for piggyback, automobile cars, and over-dimension loads to industries such as General Electric at Pittsfield and Lynn, Plate "C" clearances are generally satisfactory. The piggyback and automobile traffic clearances, as well as existing clearances to General Electric at Lynn (via the Saugus Branch) are maintained in the proposed freight system over the Boston & Albany corridor. All lines on which catenary extensions are recommended should have Plate "C" clearance to minimize the cost of

clearance improvements. The clearance restrictions desired should be included in acquisition conditions.

The proposed joint use of the Boston & Albany and the Grand Junction Branch offers advantages to both railroads in reduced operating and maintenance expenses through shared costs of a one-corridor, east-west through-freight line in the Study Area and by making more under-utilized lines available for sale for mass transportation purposes.

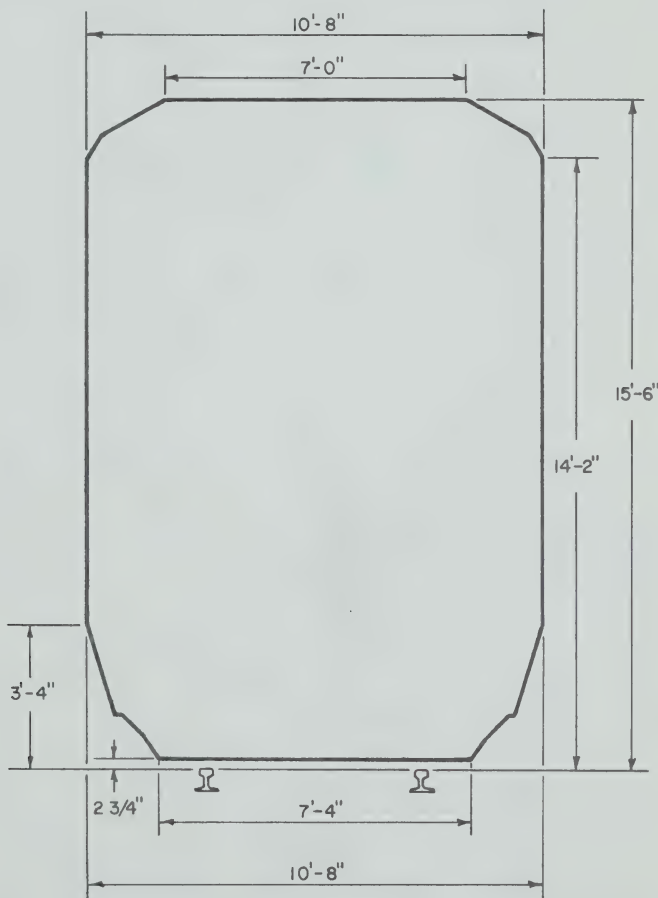
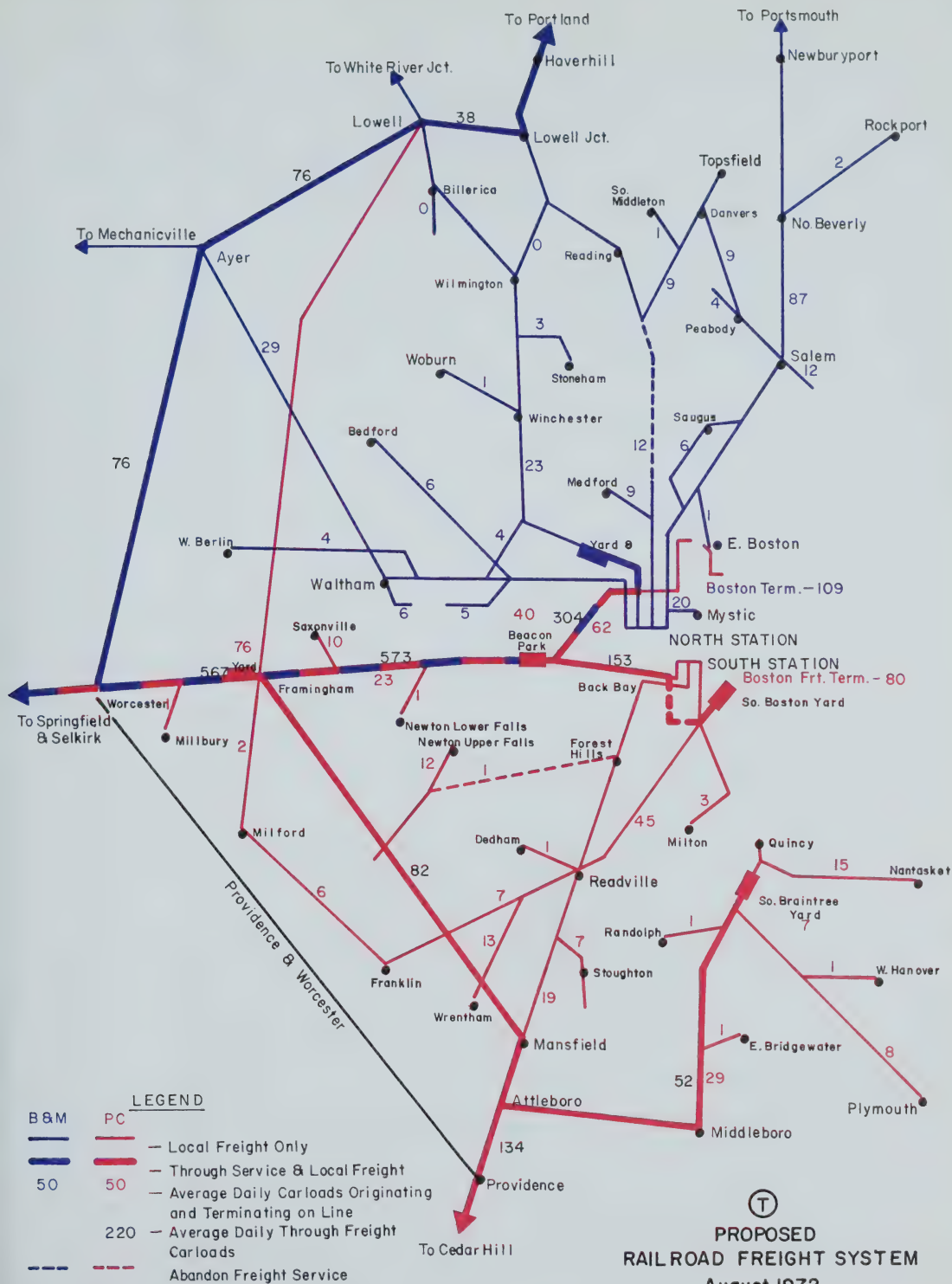


PLATE C CLEARANCE DIAGRAM



RECOMMENDED ACQUISITION PROGRAM

Recommended Right-of-Way Acquisition

Right-of-way acquisition by the MBTA is being progressed with both the Boston and Maine and the Penn Central. Upon resolution of arbitration proceedings now in the courts, the MBTA will acquire approximately 17 miles of Boston and Maine Corporation right-of-way between Boston and Wilmington Junction for extension of its Orange Line now under construction over this right-of-way to Oak Grove. Negotiations have been completed, subject to various approvals, for acquisition by the MBTA of about 146 miles of Penn Central Transportation Company's right-of-way for a consideration of 19.5 million dollars.

Acquisition of the Boston and Maine property was instituted through exercise of an option arrangement granted to the Authority in the original agreement for provision by the Railroad of passenger service for the account of the Authority. The terms of the option provided for a price that reflects the fair market value of the property for transportation purposes, which price, if not agreed to by both parties, was to be submitted to arbitration. This was the case, and the arbitrators' findings and award totaled \$18,056,896. The MBTA is presently contesting this award in Court.

Additional acquisition of, and rights to operate over, Boston and Maine rights-of-way are recommended on lines presently with passenger service.

In addition, purchase of the Central Massachusetts Branch, which had passenger service until the Fall of 1971, and the Fitchburg Freight Cut-off, which serves a heavily populated area of Somerville, should be considered.

Acquire Fee to Lines

Line	Location	Miles
Portland East	MP 8.0 Oak Island to MP 37.3 Newburyport	29.3
Gloucester Branch	MP 18.7 Beverly Jct. to MP 35.3 Rockport	16.6
Portland West	MP 17.2 Wilmington Jct. to MP 19.4 Lowell Jct.	2.2
New Hampshire	MP 1.8 Mystic Jct. to MP 24.7 Bleachery	22.9
Woburn Branch	MP 0.0 Winchester to MP 2.1 Woburn	2.1
Wilmington Branch	MP 0.0 Wilmington to MP 3.0 Wilmington Jct.	3.0
Fitchburg	MP 1.2 Tower H to MP 33.7 Willows	32.5
Fitchburg Freight Cut-off	MP 0.0 Somerville Jct. to MP 4.0 Hill Crossing	4.0
Bedford Branch	MP 4.2 W. Cambridge to MP 14.8 Bedford	10.6
Central Mass. Branch	MP 8.3 Clematis Brook to MP 32.2 W. Berlin	<u>23.9</u>
Total		147.1

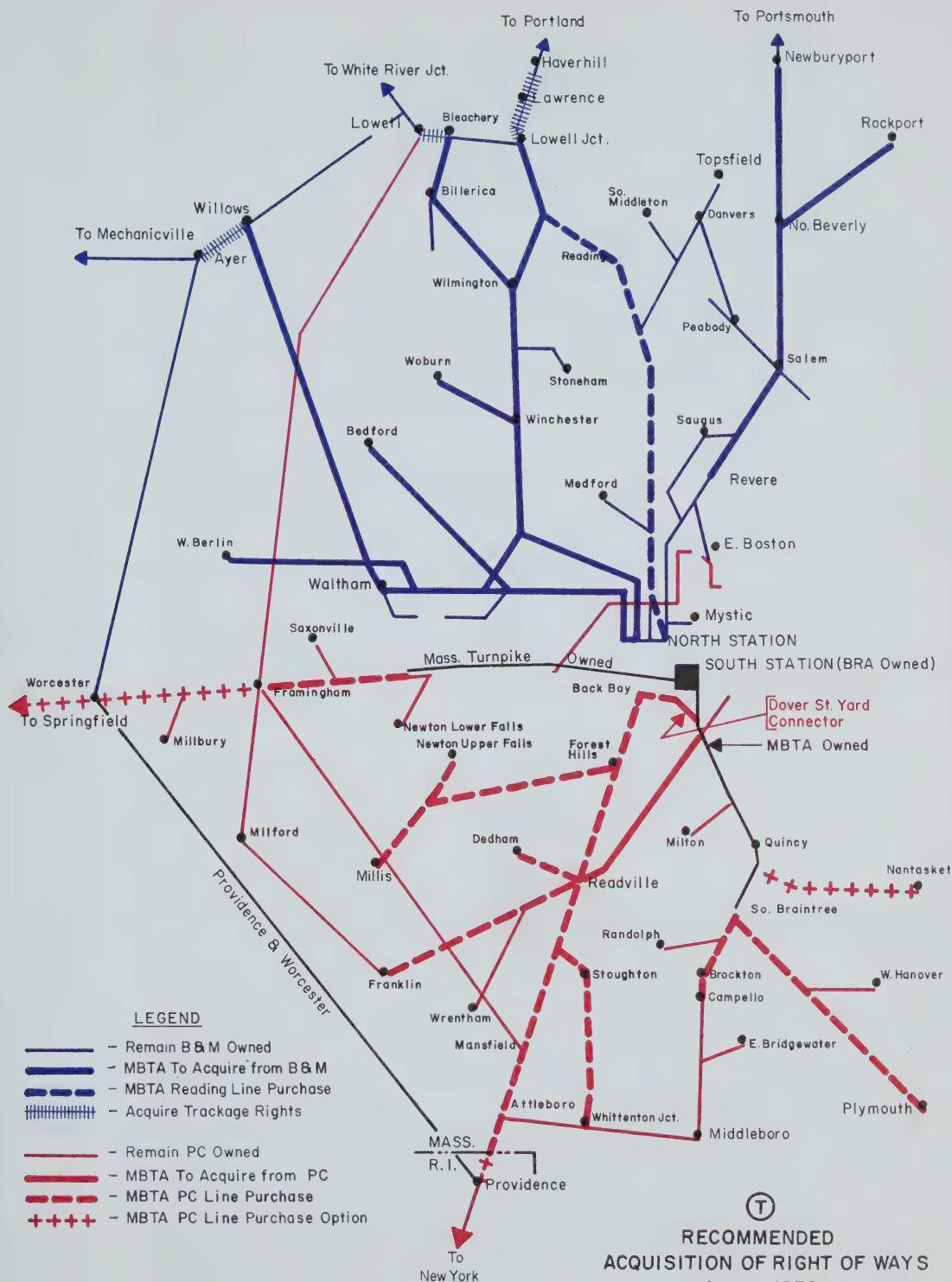
Where passenger service will extend onto the Railroads' "route 495" connecting the Boston and Maine's radial lines and also serving as the rail-road freight corridor to Maine and New Hampshire for both the Penn Central and the Boston and Maine, acquisition of operating rights only is recommended.

Line	Acquire Operating Rights	
	Location	Miles
Portland West	MP 19.4 Lowell Jct. to MP 33.0 Haverhill	13.6
New Hampshire	MP 24.7 Bleachery to MP 25.4 Lowell	0.7
Fitchburg	MP 33.7 Willows to MP 36.1 Ayer	<u>2.4</u>
	Total	16.7

Acquisition of the Dorchester Branch of the Penn Central should be considered in addition to the lines now proposed for acquisition and pending Federal and Railroad approval:

Dorchester Branch	MP 1.1 South Bay to MP 10.1 Readville	9.0 miles
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A schematic map on page 116 shows the lines recommended for acquisition or purchase of operating rights as well as the Reading Line purchase, the MBTA-Penn Central agreement for right-of-way acquisition now pending approval, and rights-of-way now owned by the MBTA, Massachusetts Turnpike, and the Boston Redevelopment Authority.



Recommended Conditions for Right-of-Way Acquisition

Negotiations for acquisition of the recommended Boston and Maine Corporation rights-of-way should include the following conditions and agreements:

1. The MBTA will acquire all of the right, title, interest, and control in and of the real estate and improvements thereon without reservation or other encumbrances not of record at the time of execution of agreement.
2. Consideration to be paid by the Authority to the Railroad shall be for the fair market value of the facility with full and complete control of said facility vested in the Authority, subject to the obligation of the Authority with respect to Railroad compliance with laws, regulations and jurisdiction of Federal and State regulatory agencies concerning freight operations. Such consideration as agreed to and paid shall be full and complete payment for the property so acquired.
3. In recognition of the Railroad's obligation to comply with applicable statutes governing freight operations, the Authority will lease to the Railroad, under appropriate terms and conditions, that portion of the acquired facilities as may reasonably be required to continue to provide freight services to existing customers or to future customers subject to approval of the Authority.

Lease of minimum necessary facilities of any given line or portion thereof by the Authority to the Railroad shall provide in part:

- a. Railroad through-freight operations will be permitted only over lines specified in the purchase agreement with the Authority. Local freight trains will operate over all lines requiring service. The railroad will apply for abandonment of freight service on those lines or portions thereof specified in the purchase agreement.
- b. The Railroad will also agree to publish clearances on all lines as listed in the purchase agreement and any future increase in clearances for freight operations will be at the expense of the Railroad.
- c. At the request of the Authority, the Railroad will make reasonable adjustments in scheduling of local freight and switching operations so as not to interfere with the passenger operations of the Authority particularly at peak commuter service periods.
- d. All train movements, freight and passenger, will be under the control and direction of the Authority.
- e. The term of the lease shall be limited to that point in time when the traffic on a line justifies the Railroad's petitioning for and obtaining from the regulatory bodies permission to abandon freight service, or the Authority petitions such regulatory bodies in the public interest.

- f. The rental to be paid to the Authority by the Railroad will be on an annual basis and will be based on return on the investment of the Authority in the facilities required and used by the Railroad.
- g. Maintenance of facilities within the leased area which are solely required for freight service will be performed at the sole expense of the Railroad. Facilities required solely for the benefit of the Authority will be at the sole expense of the Authority. The cost of maintenance of facilities required by both parties will be apportioned on a ton-mile basis, or other equitable basis mutually agreed to, except that where the level of maintenance required by one party is greater than that required by the other, the differential cost will be assessed to the benefited party.

It should be noted the Railroads have sold easements to power companies on terms whereby cessation of use for Railroad purposes requires deeding the line to the power company upon request. Each lease or easement should be reviewed to determine the effect on the fair market value of the line and whether rapid transit use by the MBTA is considered a "Railroad purpose" under the lease or easement.

Some of the lines on which such leases or easements exist are:

Gloucester Branch	Beverly Jct. to Gloucester
Central Mass. Branch	Main St. Waltham to Landham Rd., Sudbury
Needham Branch	Baker St., W. Roxbury to Needham Jct.

Recommended Acquisition of Terminal Areas

1. Boston and Maine

Connecting the four corridors of the Boston and Maine to the MBTA for overhead catenary transit extensions requires acquisition of railroad property in East Cambridge (Yard 7) and Somerville (Yard 8) to construct a new Lechmere Station and the Green Line Connector to the Fitchburg, Fitchburg Freight Cut-off, and New Hampshire lines. After the four railroad corridors are connected to the Green Line, Orange Line, and Blue Line, and the overhead catenary extension system completed, the terminal facilities of the Boston and Maine, including North Station, are no longer necessary. It is recommended that a corridor be acquired in the North Station area to construct a new Green Line between Leverett Circle and a relocated Green Line North Station, south of Causeway Street, to eliminate the Green Line elevated structure in Causeway Street and improve alignment.

The so-called terminal area, comprising the land from North Station to Drawbridges 7 and 8, to Mystic Junction and to the Somerville Avenue bridge, contains approximately 190 acres of remaining Boston and Maine ownership.

This land is situated in Boston (30± acres), Cambridge (45± acres),

and Somerville (115± acres). Its present use will be substantially reduced when the rail commuter service is eliminated by the proposed transit extensions.

Proposed changes in freight operations whereby through-freight movements to Boston and Maine destinations in the Core Area will be via the Boston & Albany and the Penn Central Grand Junction Branch, could provide an opportunity for new development of the areas now occupied by supporting railroad facilities through the construction of facilities for the future switching and servicing railroad needs outside the terminal area.

Tracts of land which will become substantially available in the terminal area are:

Boston

North Station track and platform area	4 acres
Prison Point Bridge northerly to Somerville Line	16 acres

Cambridge

Charles River to Prison Point Bridge	21 acres
Prison Point Bridge to Lechmere Square and beyond, including the piggyback area	21 acres

Somerville

Boston Engine Terminal Area	27 acres
Yard #14 Area	21 acres
Yard #8 Area	32 acres
Yard #21 Area	19 acres

The movement of freight within or through this area will require right-of-way which can be kept to a minimum if the supporting facilities are maintained outside of this area.

Replacement of the necessary railroad facilities would involve about 35 acres of land on which the following would be constructed.

- 2 Receiving Tracks 3000 feet long
- 2 Departure Tracks 3000 feet long
- 15 Classification Tracks 1200 feet long
- Locomotive fueling, sanding, light repairs,
and inspection
- Car repair and car cleaning
- Piggyback and Public Delivery

Right-of-way and terminal area acquisition agreements should include conditions requiring the necessary railroad relocation and reserving the necessary right-of-way corridors through the area for the railroad.

The 190 acres of railroad land which will become substantially available will be served by a new Lechmere Terminal with suburban transit service to the northwest and extensive new transit service to Somerville, Porter Square, and North Cambridge. In addition, two new Orange Line transit stations will serve the area, Community College and Sullivan Square, with suburban transit extensions out to Reading and Route 93. To the south, the elimination of the Green Line's Causeway Street elevated structure

and construction of two new North Stations on Causeway Street (Orange and Green Line) should spark new development connecting Government Center to the 190-acre terminal area.

The development of the terminal area would require acquisition and planning by several agencies -- the Metropolitan District Commission, for development along both banks of the Charles River; the Department of Public Works, for highway construction; the cities of Boston, Cambridge and Somerville, for urban renewal purposes; and the Massachusetts Bay Transportation Authority, for construction of transit facilities. In order to facilitate acquisition of railroad land and because the Authority must complete its construction and relocation of the railroad to make the terminal area available, it is recommended the Authority consider acquiring the entire terminal area subject to agreements with the other agencies as to utilization of the land and ultimate purchase by the using agency. A map of the terminal area is on the following page.

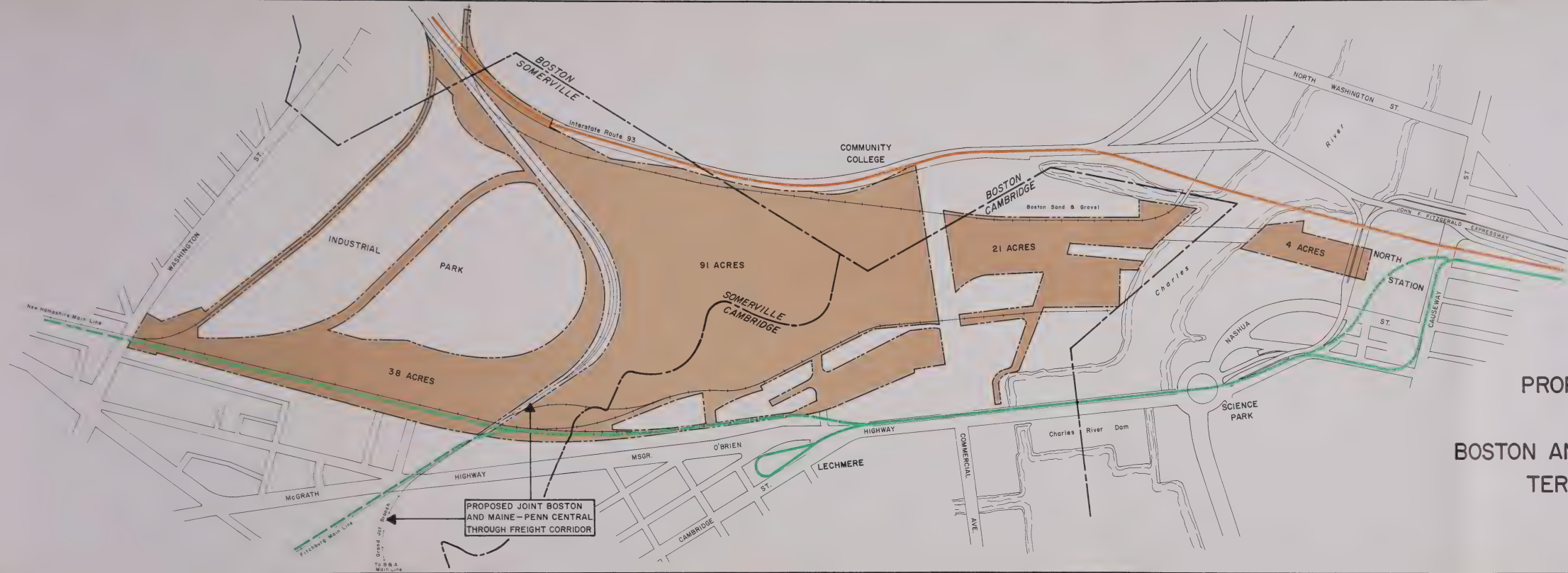
2. Penn Central

Railroad land necessary for a connection from the MBTA Dover Street Yard to the Orange Line east of Back Bay should be acquired. In addition, the MBTA should consider purchasing the land and tracks in South Station, now owned by the Boston Redevelopment Authority, as a logical adjunct to the purchase of the Shore Line and Dover Street Yard. Yard 5 (3.5 acres), opposite Dover Street Yard, and Southampton Street Yard (23 acres), south of Dover Street Yard,

should also be considered for acquisition for yard servicing expansion purposes, lease to Amtrak for intercity service, and use in connecting the Dorchester Branch to the Red or Orange Lines. Portions of those yard areas and air rights might be made available to the City of Boston for extension of its South Station Project.

Acquisition of Equipment

Consideration should be given to the purchase, or long term lease, of 48 Boston and Maine Budd cars to be re-engined and used on both the Penn Central and Boston and Maine during the suburban transit extension construction period and for the proposed Boston & Albany upgraded Budd car service. The remaining railroad equipment should be on short-term lease until it can be released by completion of transit extensions. It is recommended equipment needs and agreement for continuation of existing railroad passenger service during construction of the suburban transit extensions be included as conditions of acquisition of railroad rights-of-way and terminal properties.



PROPOSED ACQUISITION
 of
BOSTON AND MAINE CORPORATION
TERMINAL FACILITIES

AUGUST 1972

Thomas K. Dyer, Inc.

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CAPITAL COST AND CONSTRUCTION SCHEDULING OF SUBURBAN TRANSIT SYSTEM

This report recommends suburban rail transportation by means of "minimum cost", overhead catenary transit extensions on five of the six rail-road passenger corridors now entering Boston and up-graded Budd car service for the sixth (Boston and Albany) corridor. The radial limit of transit extensions in the corridors and on the corridor branch lines should be determined by cost benefit analysis.

Radial bussing to the end of transit extensions should be evaluated against the capital and operating costs of further transit extension on the lighter density segments of the rail corridors.

Circumferential bussing to the rail corridors should be provided to increase the availability of mass transportation in the suburbs.

The traffic forecasts necessary to properly evaluate the outer limits to which rail transportation should be operated are dependent in part on the highway system to be provided into the Core Area and the extent to which the public will patronize an improved rail transportation system.

The decisions necessary to establish a definitive highway plan are expected in the near future. Forecasting the passengers to be attracted to improved rail transportation should be more accurate as the patronage derived from rail improvement projects now underway becomes known.

Preliminary estimates to determine the cost range of overhead catenary transit extensions have been prepared in 1972 dollars. Acquisition costs of rights-of-way, terminal property, and railroad equipment are not included in the cost due to the dispute over the arbitration award on the Reading Line and negotiations underway for additional railroad property.

The construction cost estimates for transit extensions have been prepared for all lines on which rail commuter service is now operated and, also, lines on which potential for rail service appears to exist to assist in planning the radial limits of transit extensions and construction priorities.

Pages 136, 137, 138, 139, and 140 are estimates of the minimum cost and minimum time necessary to construct an overhead catenary transit extension system for all lines presently with railroad commuter service presented in a suggested priority order to attain specific program objectives. The minimum cost is based on installing the overhead catenary power system and operating over the railroad tracks in the present condition. Also included in the minimum cost is a phased up-grading program for tracks (deferred maintenance) and the 48 Budd cars recommended for purchase by the Massachusetts Bay Transportation Authority. The minimum cost does not include improvements to rights-of-way, tracks, signals, and stations, or grade crossing eliminations.

Improvement costs for the existing commuter territory are shown on page 141. The improvement costs include double tracking single track lines and the additional transit equipment which would be required for a 50% increase in revenue passengers.

The estimated costs to construct overhead catenary extensions on lines not now carrying passenger service are given on page 142, divided between short-term (minimum cost) and long-term (improvement) costs.

Construction and equipment costs have been divided in accordance with the source of funding as follows:

1. Transit funds for the purchase of equipment and track, station, and signal construction.
2. Highway funds are available for transit parking facilities, including access road construction and for elimination of highway-rail grade crossings.
3. Power company funds are recommended for construction of the overhead catenary and power system. (Trolley wire to be owned and installed by the Authority).
4. Railroad funds to be used for the relocation of railroad facilities. Relocation costs would be reflected in Authority rights-of-way acquisition costs.

The cost estimates prepared for evaluation and planning purposes cover construction and equipment costs for overhead catenary transit extensions over railroad rights-of-way by lines, and segments of lines, totaling 319 miles of road. The total estimated cost, if overhead catenary transit extensions were found feasible on all the lines analyzed, divided into funding sources is:

\$365,000,000	Transit Funds
370,000,000	Highway Funds
96,000,000	Power Co.
<u>7,000,000</u>	Railroad
\$838,000,000	

Comparative per mile construction costs of the three rail transportation systems considered in this report are estimated to be:

<u>Rail System</u>	<u>Total/Mile Construction Cost</u>	<u>Transit Funds Only/Mile Construction Cost</u>
1. Commuter Railroad Improvement Program	\$1,500,000	\$ 500,000
2. Overhead Catenary Transit Extension Program	\$2,400,000	\$ 900,000
3. South Shore Style Third Rail Transit Extension	\$8,000,000	\$6,000,000

It should be noted the above costs are not for equivalent systems. The up-graded commuter railroad system does not include the cost of a railroad connection between North and South Stations required to improve the Boston Terminal locations. Addition of the connector to the construction cost is estimated to increase the per mile cost of an improved commuter railroad by \$1,000,000 to \$2,000,000 per mile depending on the number of miles over

which the cost is distributed. This increased cost would appear to be added to both cost columns above, i.e., total/mile construction cost and transit funds only/mile construction cost.

The South Shore style third rail extension provides a system completely separated from the railroad local freight operations unlike either the improved commuter railroad or the overhead catenary transit extension program. A passenger system completely separated from freight operations offers greater safety and dependability than can be provided by joint passenger-freight operation over the same tracks.

The Red Line extension from Harvard Square to Alewife Brook is not included in the estimated construction costs pending the results of engineering studies now in progress by the Authority to determine a route and construction methods. The costs of subway improvements are not included in the cost estimates as such costs were considered to be outside the scope of this report. No subway improvements other than those for lengthening station platforms now included in the Authority's master plan were considered in evaluating railroad right-of-way use.

Since detailed arterial roadway plans in the Southwest Corridor are not available at this time, cost estimates for transit construction on the Shore Line to Forest Hills and thence to Needham have been based on the following status of events and premises:

1. The Legislature has appropriated funds for the Orange Line extension out the Needham Branch.

2. The Authority will own the rights-of-way on execution of the purchase agreement with the Penn Central.
3. The South Cove connector to the Shore Line is completed from Stuart Street to the Massachusetts Turnpike.
4. Highway construction in the Southwest Corridor is still several years away.
5. The Governor's recent message containing his decisions concerning transportation facilities to be constructed into Boston strongly recommended emphasis be placed on public transportation in future construction.
6. Construction of the Orange Line extension out the Needham Branch should not be further delayed by the problems involved in highway construction in the corridor.

In order to progress extension of the Orange Line to Needham, the following construction procedure is recommended and is the basis of cost estimates in this report:

1. Complete the Orange Line connector to the Shore Line from the Mass. Turnpike to Arlington Street.
2. Construct an overhead catenary power system over the two westerly Shore Line tracks from Arlington Street to Forest Hills. The two westerly tracks to be used exclusively by the Authority. Amtrak, local freight operation, and Shore Line commuter trains (until overhead catenary transit extension is constructed from

Forest Hills south) to operate on the two easterly tracks.

3. Construct an overhead catenary power system transit extension out the Needham Branch including double track to W. Roxbury. Freight service to be abandoned from Forest Hills to Needham Jct.
4. The existing Orange Line Washington Street Elevated service to remain during this construction phase.

The above procedure will permit progressing the Needham Branch Orange Line extension independently of highway construction north of Forest Hills. Since the Shore Line tracks can be used in their present condition and station changes at Back Bay held to a minimum by the proposed operation, the overhead catenary construction from Back Bay to Forest Hills is the only proposed work which would require relocation when highway facilities are constructed. At that time, transit stations between Back Bay and Forest Hills can be constructed after which the Washington Street elevated structure can be removed. The maximum benefit from highway funding would appear to result from this construction procedure.

When the additional transit station stops are constructed, a third track should also be constructed between Forest Hills and Back Bay for express service from the Needham Branch and future Shore Line transit service south of Forest Hills. The cost estimates in this report do not include the construction and relocation of transit facilities between Forest Hills and Back Bay which will be carried out in connection with highway construction north of Forest Hills in the Shore Line corridor.

Cost estimates are based on the grade separation of all highway

crossings as a long-term improvement on any lines on which transit operations will be conducted. The following criteria are recommended for establishing construction priority of highway-rail grade separation work:

1. In descending order of the exposure factor (product of the number of trains per day and the number of highway vehicles per day) for each crossing.
2. Higher priority should be given to crossings with increased accident potential due to location and local conditions which cause frequent back-up of vehicles onto the rail crossing.

In addition to grade-separated crossings for lines on which transit trains will operate, equal priority should be established for the Boston & Albany Line which is recommended for increased freight train operation over grade crossings already causing severe traffic congestion in Framingham, Ashland and other locations.

In the cost estimates, the New Hampshire Main Line is connected to the Green Line at Lechmere. After replacement of railroad commuter service to North Station with overhead catenary transit extensions and relocation of Boston and Maine freight facilities, it would be very simple to connect the New Hampshire Line to the Orange Line. Consideration in the long term should be given to serving the Fitchburg and Fitchburg Freight Cut-off out to Alewife Brook and the New Hampshire out to Medford Hillside or West Medford with the Green Line and serving north of Medford Hillside or West Medford with the Orange Line.

The minimum cost overhead catenary extension program proposes operating in the initial stages over the existing railroad grade crossings and proposes joint operation with railroad local freight service similar to the operation of the existing railroad passenger service. As long as the passenger service operates over highway grade crossings, service frequency on the overhead catenary extensions would be similar to railroad commuter operations of the past several years. A 50% increase in passengers carried as compared to the existing service would appear to be the approximate capacity of the minimum cost system until portions of a highway grade separation improvement program are completed.

Transit train frequencies could be operated where demand requires on continuous segments of the system with no highway grade crossings during morning and evening peaks. However, local freight use of transit tracks would restrict off-peak service to approximately thirty-minute frequency and scheduled trains. If more off-peak service became necessary, local freight service would need to be separated from passenger service either with separate tracks for the freight operation, or night operation after transit service ends. Night operation of local freight service in residential areas is generally impractical.

Since the minimum cost overhead catenary transit extension program for a major portion of the territory now covered by the railroad commuter service is estimated to require seven to twelve years to construct, an interim commuter railroad service should be provided. An upgrading program for

the fixed plant should be progressed to maintain adequate railroad commuter service and to upgrade the plant to be utilized in the transit extension program. Upgrading of railroad equipment should be limited to that necessary for operation of the interim railroad commuter service. A summary of the estimated cost to construct an overhead catenary transit extension system in the existing railroad commuter territory and the estimated time necessary to carry out the program is on page 135. As previously mentioned, cost estimates do not include acquisition of railroad plant or railroad equipment, the construction cost from Harvard Square to Alewife Brook, or improvements to the present transit system.

ESTIMATED COST AND CONSTRUCTION TIME
OF OVERHEAD CATENARY TRANSIT EXTENSION SYSTEM
FOR EXISTING RAILROAD COMMUTER TERRITORY (204 Road Miles)

Item	Funding Sources			Total
	Transit	Highway	Power Co. or Railroad	
Minimum-cost OH catenary transit exten- sions (10 years±)	\$ 79,900,000	\$ -	\$62,750,000	\$142,650,000
New transit equip. with seating capa- city of exist. RR equip. (10 years±)	52,100,000	-	-	52,100,000
Upgrading track program (10 years±)	16,000,000	-	-	16,000,000
Upgrade RR equip. for interim serv. (5 years±)	3,200,000	-	-	3,200,000
RR facility changes (10 years±)	<u>1,400,000</u>	<u>40,000,000</u>	<u>6,500,000</u>	<u>47,900,000</u>
Sub-Total (10 years±)	\$152,600,000	\$ 40,000,000	\$69,250,000	\$261,850,000
Long-term improvements incl. elim. of hwy. Xings, 50% more transit equip. and station improvements (20 years±)	<u>114,200,000</u>	<u>205,500,000</u>	<u>-</u>	<u>319,700,000</u>
Grand Total	\$266,800,000	\$245,500,000	\$69,250,000	\$581,550,000

PROPOSED SUBURBAN TRANSIT SYSTEM

CONSTRUCTION COST ESTIMATES

ITEM	OAK GROVE TO READING	BACK BAY TO NEEDHAM
Connector - Transit To Railroad R of W	—	11,000,000
Improve Clearances For O.H. Catenary	50,000	200,000
Gauntlet Tracks At Stations	900,000	200,000
O.H. Catenary And Power System	2,600,000	3,500,000
Trolley Wire	1,000,000	900,000
Converting Signals For Electrification	1,200,000	600,000
High Level Platforms	300,000	400,000
Miscellaneous Changes	250,000	300,000
Sub-total	6,300,000	17,100,000
Purchase Transit Equipment	8,000,000	
Upgrading Track Program - All Rail Corridors (25%)	4,000,000	
Upgrading 12 MBTA Purchased Budds	800,000	
Total	\$ 36,200,000	

KEY EVENTS

MINIMUM COST - MINIMUM TIME ESTIMATE

1. Release 20 MBTA Budd Cars from Boston & Maine Reading Service. Release P-C Needham Branch Equipment.
2. Replace all Penn Central Conventional Suburban Service Equipment with Budd Cars.
3. Reduce Annual Operating Costs of Service \$ 200,000.

WORK TO BE DONE

1. Extend Orange Line from Oak Grove to Reading with O.H. Catenary System.
2. Complete Construction of Orange Line Connector from Stuart St. to Arlington St. East of Back Bay.
3. Construct O.H. Catenary Power System from Back Bay to Needham.
4. Purchase Transit Equipment to Replace Railroad Equipment in use on Reading and Needham Lines.
5. Upgrade 12 MBTA Owned Budd Cars.
6. Complete 25 % of Track and R of W Upgrading Program for Railroad Corridors.

ESTIMATED CONSTRUCTION COST & FUNDING SOURCE

Transit	Highway	Power Co. or Railroad	Total	Minimum Construction Time
30,100,000	—	6,100,000	36,200,000	3 yrs.

PROPOSED SUBURBAN TRANSIT SYSTEM

CONSTRUCTION COST ESTIMATES

KEY EVENTS MINIMUM COST - MINIMUM TIME ESTIMATE

ITEM	WONDERLAND TO NORTH BEVERLY	LECHMERE TO ALEWIFE BROOK	LECHMERE TO WINCHESTER HLDS. AND WOBURN
Connector - Transit To Railroad R of W	3,000,000	5,600,000	1,000,000
Improve Clearances For O.H. Catenary	200,000	100,000	300,000
Gauntlet Tracks At Stations	900,000	150,000	—
O.H. Catenary And Power System	5,100,000	1,300,000	3,200,000
Trolley Wire	1,900,000	350,000	1,400,000
Converting Signals For Electrification	1,400,000	350,000	900,000
High Level Platforms	200,000	50,000	—
Budd - Transit Interchange	1,200,000	800,000	700,000
Miscellaneous Changes	450,000	100,000	300,000
Sub-total	14,350,000	8,800,000	7,800,000
Purchase Transit Equipment		15,500,000	
Improve Clearances Framingham to Boston and Grand Jct. Branch		1,400,000	
Grade Separate Grand Jct. Branch		40,000,000	
Upgrading Track Program All Rail Corridors (20%)		3,200,000	
Upgrading 12 MBTA Owned Budd Cars		800,000	
Total		91,850,000	

1. Close North Station	
2. Annual Operating Cost Savings	
a. Close North Station	- \$ 800,000
b. Train Operating Savings	- 100,000
Total	- \$ 900,000
3. Four (4) Acres of Land at No. Station made available for Development.	
4. Release 14 Budd Cars.	

WORK TO BE DONE

- Construct Connecting Links for Blue Line at Wonderland to Portland East and for the Green Line at Lechmere for the Fitchburg and New Hampshire Lines.
- Construct O.H. Catenary Transit Extensions from Wonderland to No. Beverly, Lechmere to Alewife Brook, and Lechmere to Winchester Highlands and Woburn.
- Construct Budd-Transit Interchanges at Beverly Jct. for Gloucester Br. and No. Beverly for Newburyport, at Alewife Brook for Ayer and Bedford Service, and at Winchester Highlands for Lowell and Haverhill.
- Purchase Transit Equipment for Extensions above.
- Upgrading Track Program and Upgrading MBTA Budd Cars.
- B.& M. Through Freight Service over B.& A. Grand Jct. Branch.
- Grade Separate Grand Jct. Branch

ESTIMATED CONSTRUCTION COST & FUNDING SOURCE			Minimum Construction Time
Transit	Highway	Power Co. or Railroad	Total
42,250,000	40,000,000	9,600,000	91,850,000
			3 yrs.

1. Eliminate Green Line Elevated in Causeway St.

WORK TO BE DONE

- Construct Relocated Green Line through Railroad North Station area.
- Construct New Green Line North Station South of Causeway St.

ESTIMATED CONSTRUCTION COST & FUNDING SOURCE			Minimum Construction Time
Transit	Highway	Power Co. or Railroad	Total
—	—	—	14,000,000*
			3 yrs.

* Urban Renewal Funds should bear major share of cost.

PROPOSED SUBURBAN TRANSIT SYSTEM

CONSTRUCTION COST ESTIMATES

ITEM	FOREST HILLS TO READVILLE
Improve Clearances for O. H. Catenary	150,000
Garment Tracks at Stations	200,000
O.H. Catenary and Power System	1,500,000
Trolley Wire	700,000
Converting Signals for Electrification	500,000
High Level Platforms	50,000
Budd-Transit Interchange	800,000
Miscellaneous Changes	100,000
Sub-total	4,000,000
Purchase Transit Equipment	4,600,000
Upgrading Track Program (10%)	1,600,000
Upgrading 12 MBTA Budd Cars	800,000
Total	11,000,000

KEY EVENTS

MINIMUM COST - MINIMUM TIME ESTIMATE

1. Elimination of Suburban Service to South Station.				
2. Annual Operating Savings				
a. South Station — \$ 600,000				
b. Train Operation — 50,000				
Total — \$ 650,000				
3. Release 6 Budd Cars.				
WORK TO BE DONE				
1. Construct O.H. Catenary Orange Line Transit Extension from Forest Hills to Readville.				
2. Construct Budd - Transit Interchange at Readville for Franklin and Shore Line Suburban Service.				
3. Turn back Facilities for B & A Service at Back Bay				
4. Purchase Transit Equipment.				
5. Complete 10% of Track Upgrading Program and Upgrade 12 MBTA Budd Cars.				
ESTIMATED CONSTRUCTION COST & FUNDING SOURCE				
Transit	Highway	Power Co. or Railroad	Total	Minimum Construction Time
9,500,000	—	1,500,000	11,000,000	2 yrs.

PROPOSED SUBURBAN TRANSIT SYSTEM

CONSTRUCTION COST ESTIMATES

ITEM	ALEWIFE BROOK TO AYER & BEDFORD	WINCHESTER HILLS TO LOWELL & HAVERHILL	NO. BEVERLY TO NEWBURYPORT & ROCKPORT
Improve Clearances For O.H. Catenary	100,000	2,600,000	700,000
Gauntlet Tracks At Stations	3,000,000	—	1,450,000
O.H. Catenary And Power System	12,400,000	10,650,000	9,100,000
Trolley Wire	4,400,000	3,650,000	3,300,000
Converting Signals For Electrification	1,800,000	3,100,000	1,800,000
High Level Platforms	700,000	—	350,000
Miscellaneous Changes	500,000	600,000	300,000
Sub-total	22,900,000	20,600,000	17,000,000
Purchase Transit Equipment		12,000,000	
Relocate Boston Freight Facilities		5,000,000	
Upgrading Track Program (25 %)		4,000,000	
Upgrading 12 MBTA Budd Cars		800,000	
Total			82,300,000

KEY EVENTS

MINIMUM COST - MINIMUM TIME ESTIMATE

1. Replacement of all Boston & Maine Equipment with Transit Equipment.
2. Reduce annual operating costs: a. Terminal Costs — \$ 400,000 b. Train Operating Costs — <u>500,000</u> \$ 900,000
3. Terminal Property North of Charles made substantially available for Development: Boston 26 Acres Cambridge 45 Acres Somerville 115 Acres

WORK TO BE DONE

- Construct Overhead Catenary Transit Extensions:
 - Alewife Brook to Ayer and Bedford
 - Winchester Highlands to Lowell and Haverhill
 - No. Beverly to Newburyport and Rockport
- Purchase Transit Equipment to Replace Railroad Equipment on Above Listed Lines.
- Complete 25% of Track Upgrading Program.
- Upgrade 12 MBTA Budd Cars.
- Relocate Boston Freight Facilities.

ESTIMATED CONSTRUCTION COST & FUNDING SOURCE			Minimum Construction Time
Transit	Highway	Power Co. or Railroad	Total
45,150,000	—	37,150,000	82,300,000
			4 yrs.

PROPOSED SUBURBAN TRANSIT SYSTEM
LONG TERM IMPROVEMENTS ON LINES WITH PASSENGER SERVICE NOW

(ESTIMATED CONSTRUCTION TIME 20 YEARS)

ITEM	WONDERLAND TO NEWBURYPORT	OAK GROVE TO READING	LECHMERE TO LOWELL BHAVERHILL	LECHMERE TO AYER	BEVERLY TO ROCKPORT	ALEWIFE BROOK TO BEDFORD	WINCHESTER TO WOBURN	BACK BAY TO ATTLEBORO	FORESTHILLS TO NEEDHAM	READVILLE TO FRANKLIN	CANTON JCT. TO STOUGHTON	TOTALS
Grade Crossing Elimination	20,000,000	20,000,000	15,000,000	35,000,000	20,000,000	10,000,000	5,000,000	2,000,000	6,000,000	4,000,000	2,000,000	144,000,000
Double Tracking and Passing Tracks	4,000,000	—	—	2,800,000	1,000,000	2,500,000	500,000	—	3,000,000	4,500,000	500,000	18,800,000
New or Upgraded Signalling	2,700,000	400,000	2,300,000	2,600,000	1,500,000	2,800,000	300,000	2,600,000	2,900,000	3,800,000	800,000	22,700,000
Welded Rail and Other Track Improvements	2,800,000	800,000	2,200,000	2,600,000	1,000,000	500,000	200,000	3,000,000	1,100,000	2,000,000	300,000	16,500,000
Additional Facilities and Station Improvements	3,800,000	1,500,000	3,200,000	3,500,000	2,000,000	500,000	100,000	3,000,000	1,000,000	1,000,000	250,000	19,850,000
Transit Equipment for 50 % Increase in Ridership												24,000,000
Expressway Stations	4,500,000 500,000	4,500,000 500,000	24,000,000 1,000,000	4,500,000 500,000	— —	19,500,000 500,000	— —	— —	4,500,000 500,000	— —	— —	61,500,000 3,500,000
R/W Fencing	1,500,000	300,000	1,200,000	1,500,000	800,000	500,000	100,000	1,250,000	500,000	1,000,000	200,000	8,850,000
	39,800,000 *	28,000,000 *	48,900,000 *	53,000,000 *	26,300,000 *	41,800,000 *	6,200,000 *	11,850,000 *	19,500,000 *	16,300,000 *	4,050,000 *	205,500,000 114,200,000 319,700,000

* Line Totals do not Include Purchase of Transit Equipment

Highway Funds — Green
Transit Funds — Red

PROPOSED SUBURBAN TRANSIT SYSTEM

CONSTRUCTION COST ESTIMATES

KEY EVENTS

MINIMUM COST - MINIMUM TIME ESTIMATE

ITEM	READVILLE TO ATTLEBORO	READVILLE TO FRANKLIN	CANTON JCT. TO STOUGHTON
Improve Clearances For O.H. Catenary	150,000	—	—
Gauntlet Tracks At Stations	1,000,000	1,350,000	300,000
O.H. Catenary And Power System	7,150,000	5,050,000	1,200,000
Trolley Wire	3,200,000	1,200,000	300,000
Converting Signals For Electrification	1,100,000	350,000	150,000
High Level Platforms	200,000	300,000	50,000
Miscellaneous Changes	500,000	200,000	50,000
Sub-total	13,300,000	8,450,000	2,050,000
South Boston Connector		1,500,000	
Purchase Transit Equipment		12,000,000	
Upgrading Track Program (20 %)		3,200,000	
Total		40,500,000	

1. Replace Remaining Railroad Equipment with Transit Equipment (12 MBTA Budd Cars on Boston & Albany).
2. Annual Operating Savings Train Operation - \$ 250,000
3. 34 MBTA Budd Cars Available for Service on Lines Presently Without Service.
WORK TO BE DONE
1. Construct O.H. Catenary Orange Line Extension from Readville to Franklin, Stoughton and Attleboro.
2. Construct South Boston Connector and Eliminate Through Freight Operation on Shore Line North of Mansfield, Franklin Branch and Dorchester Branch.
3. Purchase Transit Equipment for Above Extensions.
4. Complete 20 % of Track Upgrading Program.

ESTIMATED CONSTRUCTION COST & FUNDING SOURCE			Minimum Construction Time
Transit	Highway	Power Co. or Railroad	Total
25,600,000	—	14,900,000	40,500,000
			3yrs.

PROPOSED SUBURBAN TRANSIT SYSTEM

[illegible]

PROPOSED SUBURBAN TRANSIT SYSTEM

[illegible]

REGULATORY AND PERSONNEL CONSIDERATIONS

Regulatory Considerations

The sale of Railroad rights-of-way to the Authority does not in itself appear to require the approval of regulatory agencies. However, if the recommended acquisition conditions are agreed to, the following approvals may be necessary:

- (1) Trackage rights' operation of the Boston and Maine over the Penn Central via the Boston & Albany and Grand Junction Branch - Interstate Commerce Commission
- (2) Trackage rights' operation of the railroad over MBTA lines under the control of the Authority and with decreased and/or limited overhead clearances - Interstate Commerce Commission
- (3) Minimum clearance between overhead catenary trolley wire and equipment operated (six inches proposed similar to existing Penn Central minimum on Shore Line) - Massachusetts Department of Public Utilities and the U. S. Department of Transportation
- (4) Abandonment of freight service on lines or portions of lines - Interstate Commerce Commission
- (5) Discontinuance of Railroad passenger service not solely operated for the account of the MBTA - Massachusetts Department of Public Utilities and/or the Interstate Commerce Commission

- (6) In addition to regulatory agency jurisdiction, sale of Railroad lines to the Authority are subject to Amtrack's rights and Amtrack approval of any conditions which may affect their present or future operations.

In addition to the approval necessary of the recommended acquisition conditions outlined above, the Authority appears to come under the jurisdiction of regulatory agencies due to the acquisition conditions recommended as follows:

Track, Signal, Bridges, and right-of-way maintenance and construction on joint use segments - U. S. Department of Transportation and the Massachusetts Department of Public Utilities

Since the freight service will be operated by the Railroads and the MBTA passenger operations are intrastate, the Authority does not appear to come under the jurisdiction of the Interstate Commerce Commission due to the recommended purchase of rights-of-way or the acquisition conditions.

The regulatory approvals required should be obtainable without undue difficulty or changes which would significantly modify the transit extension and acquisition plan.

The additional jurisdiction of the U. S. Department of Transportation and the Massachusetts Department of Public Utilities over maintenance and construction of facilities due to Railroad use of the Authority's fixed plant does not constitute an appreciable additional cost. The safety standards of both agencies conform to generally accepted practices of rail

transportation facility maintenance and construction and are substantially followed by the Authority at present.

Personnel Considerations

The recommended overhead catenary transit extension and right-of-way acquisition program contemplates management and operating control by the Authority of the suburban service and the rights-of-way on all lines where the MBTA is the principal user including:

1. Maintenance of the fixed plant;
2. Dispatching of trains;
3. Operation of all suburban trains with electrified equipment.

The Authority will be the principal user on all Boston and Maine rights-of-way proposed for purchase under the recommended program and on all Penn Central lines except the two easterly tracks on the Shore Line from Readville to Back Bay, the Shore Line south of Mansfield, and on the Boston & Albany line.

On lines where the Authority is the principal user, railroad personnel would man and operate local freight service under the control of MBTA dispatchers. Freight agents and any other exclusively freight positions would be Railroad personnel.

It is recommended consideration be given to having train crews operating suburban service with railroad equipment be MBTA personnel at the stage in the program when railroad equipment is all MBTA owned and the cost of the service is borne entirely by the MBTA.

The proposed joint operation of railroad local freight service with MBTA passenger service will require training of dispatchers, train personnel and, to a lesser extent, maintenance-of-way personnel for the combined operation.

Sale of rights-of-way by the Railroads to the Authority and operation of passenger service by the Authority is equivalent to discontinuance of passenger service by the Railroads and the labor protective provisions of existing Interstate Commerce Commission orders and agreements between the Railroads and the Authority would apply. On lines where permission to discontinue has not yet been received, labor provisions may be imposed on the Railroads by the Interstate Commerce Commission similar to those now in effect for discontinued service.

On lines, or portions of lines, where freight service is proposed to be abandoned, labor protective provisions to affected employees will be imposed on the Railroad by the Interstate Commerce Commission.

Assumption of maintenance and dispatching responsibilities by the Authority on lines to be acquired will subject the Railroad to job protection provisions of their existing labor agreements with affected Railroad personnel.

